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ABSTRACT

This study examined the access to and use of electronic mail (e-mail) and the Internet by postsecondary instructional faculty and staff. Findings are based on a nationally representative sample of instructional faculty and staff who taught one or more classes for credit in the fall term of 1998. These data originate in the 1999 National Study of Postsecondary Faculty (NSOPF:99), a survey with a core sample of 882,00 faculty and staff members. In fall 1998, 97% of full-time instructional faculty and staff who taught classes for credit at degree-granting institutions had access to the Internet. A large majority of part-time faculty and staff also had access to the Internet. About 46% of full-time faculty and 41% of part-time faculty who taught classes for credit at doctoral-granting institutions rated their institution's quality of computing as good. Access to the Internet was widespread for postsecondary faculty and staff, but use of e-mail to communicate with students in classes was relatively lower for full-time faculty (69%) and part-time faculty (46%). Overall, the findings of this study indicate increasing integration of telecommunications technology in postsecondary settings, but the study did show wide differences between full- and part-time faculty in access to and use of telecommunications technologies. Those faculty and staff members who had access to the Internet and e-mail at home and at work were more likely to use e-mail and course-specific Web sites than those who had access only at home or only at work. Findings also show the type of institution to be a key factor in the use of e-mail and the Internet. Appendixes contain a glossary and technical notes. (Contains 7 figures, 15 tables, and 10 references.) (SLD)

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Teaching With Technology

Use of Telecommunications Technology by Postsecondary Instructional Faculty and Staff in Fall 1998

Statistical Analysis Report

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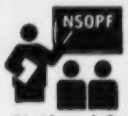

National Study of Postsecondary Faculty

U.S. Department of Education
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Teaching With Technology

Use of Telecommunications Technology by Postsecondary Instructional Faculty and Staff in Fall 1998

Statistical Analysis Report

July 2002

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Executive Summary

This report examines postsecondary instructional faculty and staff's access to and use of electronic mail (e-mail) and the Internet. Though these telecommunications technologies are rapidly becoming core components of the instructional experience of students in the United States, little descriptive information exists at the national level to address basic questions about technology use and teaching in postsecondary education. The purpose of this study is to respond to this need by answering the following questions: Who has access to telecommunications technologies (in particular, the Internet)? How much and in what ways do they use these technologies for instructional purposes? How does technology use relate to workload and contact with students? The findings of this report are based on a nationally representative sample of instructional faculty and staff who taught one or more classes for credit in fall 1998. These data originate from the 1999 National Study of Postsecondary Faculty (NSOPF:99).[1]

[1]Sponsored by the U.S. Department of Education's National Center for Education Statistics (NCES), NSOPF:99 was conducted in 1999 and asked a nationally representative sample of faculty and instructional staff about their employment and work activities in fall 1998. According to NSOPF:99, there were approximately 1.1 million faculty and instructional staff employed by public and private not-for-profit 2-year and above postsecondary institutions in fall 1998. Of these, about 976,000 reported having some instructional responsibilities for credit, including teaching classes for credit or advising students about academic activities for credit. Among these individuals, approximately 90 percent, or 882,000 (501,000 full-time and 381,000 part-time), reported teaching one or more classes for credit in fall 1998. These individuals become the core sample of this report. In the interest of brevity, these individuals are referred to as "instructional faculty and staff," "instructional faculty," or simply "faculty" throughout this report, although they are a subset of faculty and instructional staff included in the NSOPF:99.

Access to the Internet, Quality of Computing Resources, and Use of Telecommunications Technologies

Access to the Internet

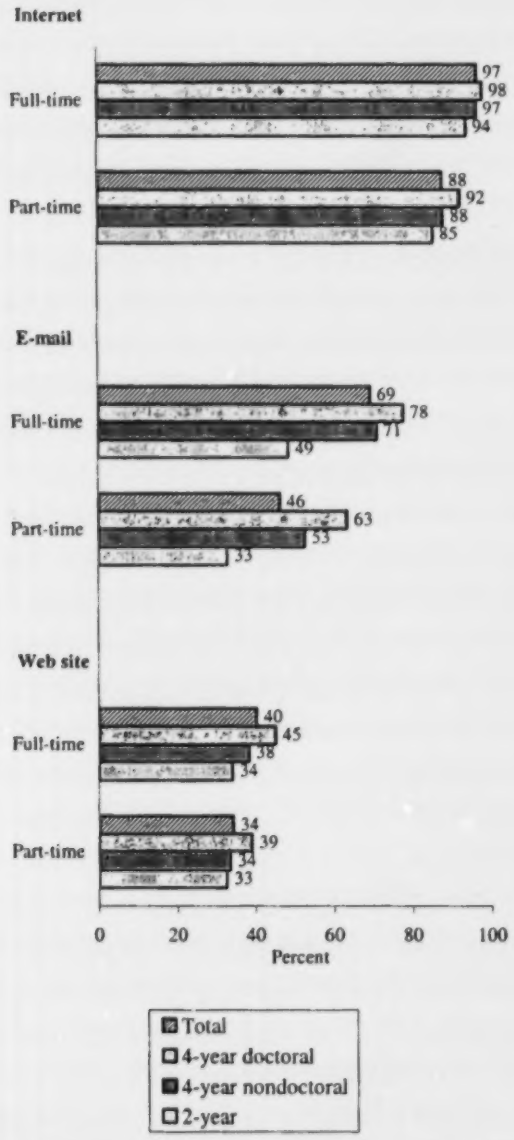
In fall 1998, 97 percent of full-time instructional faculty and staff who taught classes for credit at degree-granting institutions had access to the Internet, including 98 percent of those at 4-year doctoral institutions, 97 percent of those at 4-year nondoctoral institutions, and 94 percent of those at 2-year institutions (figure A). Though part-time instructional faculty and staff were less likely to have access to the Internet compared with their full-time counterparts, a large majority of part-time instructional faculty and staff had access to the Internet (88 percent), including 92 percent of those at 4-year doctoral institutions, 88 percent of those at 4-year nondoctoral institutions, and 85 percent of those at 2-year institutions. Both full- and part-time instructional faculty and staff were more likely to have access both at home and at work than only at work or only at home.

Quality of Computing Resources

About 46 percent of full-time faculty and 41 percent of part-time faculty who taught classes for credit at doctoral-granting institutions rated their institution's quality of computing resources as good,[2] with an additional one-third of full-time

[2]Quality of computing resources reflects the average of respondents' ratings of their institution's personal computers and local networks, centralized (main frame) computer facilities, Internet connections, and technical support for computer-related activities.

Figure A.—Percentage of postsecondary instructional faculty and staff who had access to the Internet, and who used e-mail and course-specific Web sites, by employment status and institution type: Fall 1998



NOTE: This figure includes only instructional faculty and staff who taught one or more classes for credit. E-mail use was only for communicating with students.

SOURCE: U.S. Department of Education, National Center for Education Statistics, 1999 National Study of Postsecondary Faculty (NSOPF:99).

faculty (32 percent) and one-quarter of part-time faculty (25 percent) rating the quality of computing resources as excellent. Both full- and part-time faculty at 4-year doctoral institutions were less likely than those at 4-year nondoctoral and 2-year institutions to rate the quality of their institution's computing resources as poor.

Use of Telecommunications Technologies

Although access to the Internet was widespread for postsecondary instructional faculty and staff in fall 1998 (figure A), the use of e-mail to communicate with students in classes was relatively lower both for full-time faculty (69 percent) and for part-time faculty (46 percent). The use of course-specific Web sites for classes was also lower—40 percent for full-time faculty and 34 percent for part-time faculty. Overall, full-time faculty were more likely than their part-time counterparts to use e-mail and course-specific Web sites. The use of e-mail and course-specific Web sites also varied by type of institution: overall, faculty at 4-year doctoral institutions were more likely than those at 4-year nondoctoral and 2-year institutions to use e-mail to communicate with students and were also more likely to use course-specific Web sites.

Instructional faculty and staff's use of e-mail to communicate with students in their classes was related to the level of students taught as well as to the age and principal field of teaching of faculty and staff. For example, as the age of full- and part-time instructional faculty and staff increased, their use of e-mail decreased. On average, faculty who taught both undergraduate and graduate students were more likely to use e-mail to communicate with students in their classes (81 percent of full-time and 65 percent of part-time faculty), compared with those who taught only undergraduates (66 percent of full-time and 44 percent of part-

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time faculty). Principal field of teaching also made a difference. For example, 82 percent of full-time and 65 percent of part-time engineering/computer science faculty used e-mail to communicate with students, while about one-half of full-time and 30 percent of part-time health sciences faculty used e-mail to communicate with students.

Relationship of Internet Access and Quality of Computing Resources to Instructional Use of Technology

Full- and part-time instructional faculty and staff who rated their institution's computing resources as either good or excellent were much more likely to use e-mail to communicate with students in their classes than were those who rated their institution's computing resources as poor. In addition, instructional faculty and staff's use of e-mail to communicate with students in their classes and use of course-specific Web sites was associated with their level of access to the Internet. Those who had access both at home and at work were more likely to use e-mail and course-specific Web sites than those who had access only at work, had access only at home, or had no access. However, of those who had access to the Internet both at home and at work, full-time instructional faculty and staff were more likely to use e-mail to communicate with students in their classes (78 percent) than were their part-time counterparts (64 percent).

When taking into consideration the quality of computing resources, Internet access, and other academic and demographic characteristics of faculty, these variables accounted for 24 percent of the variance in faculty use of e-mail and 6 percent of the variance in faculty use of course-specific Web sites.[3] When multivariate models were used to control for interrelationships among variables, postsecondary instructional faculty and staff who had access to the Internet both at home and at work were still more likely to use e-mail and course-specific Web sites than were those who had access only at home or only at work. Postsecondary instructional faculty and staff at 4-year doctoral institutions were also more likely to use e-mail and course-specific Web sites than were those at 4-year nondoctoral or 2-year institutions even when availability and quality of resources and other academic and demographic characteristics were taken into account.

Instructional faculty's principal field of teaching was also related to use of telecommunications technologies, while controlling for the covariation among variables. With the exception of four teaching fields (business, education, humanities, and social sciences), instructional faculty and staff who taught in the field of engineering and computer sciences were more likely to use e-mail than those who taught in other disciplines. Faculty who taught in engineering and computer sciences were also more likely than those who taught in other disciplines (except for business and vocational education) to use course-specific Web sites.

Finally, when taking the interrelationships among other variables into account, instructional faculty and staff who rated their institution's computing resources as good or excellent were more likely to use course-specific Web sites than were those who rated the computing resources as poor.

[3]Bivariate correlations showed that the effect sizes of the independent variables on use of e-mail were small to moderate, with correlations ranging in absolute value from .001 to .295. The most important factor in accounting for the variance in e-mail use was Internet access, with a correlation of .290 between having Internet access both at home and at work and e-mail use, and a correlation of -.295 between having no Internet access and e-mail use. The correlations of the independent variables to use of Web sites all represented small effect sizes, ranging in absolute value from .001 to .130 (having Internet access both at home and at work). See appendix B for details.

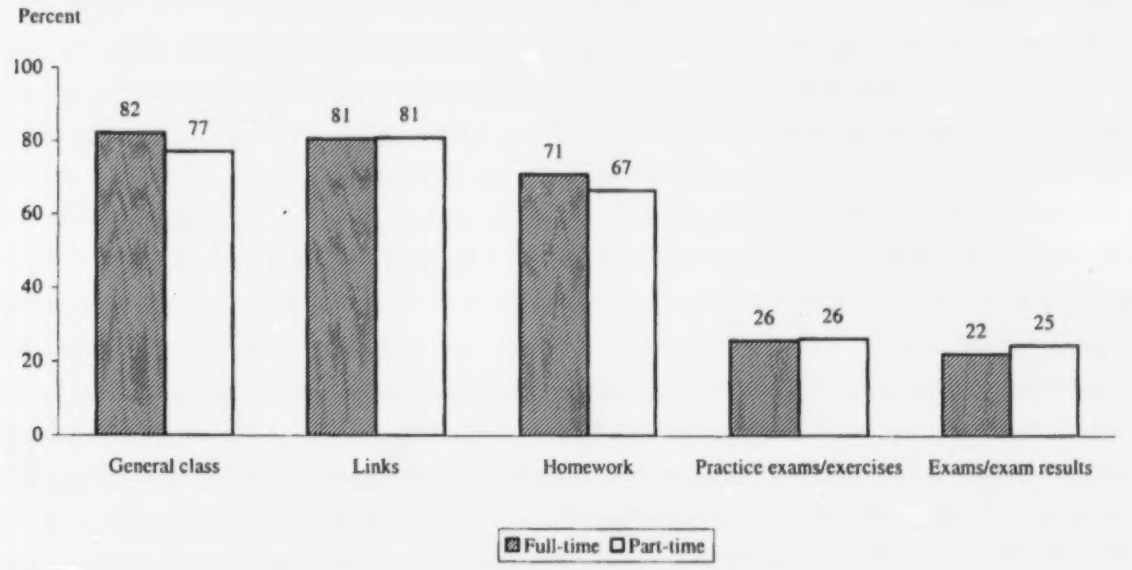
The likelihood of using e-mail and course-specific Web sites was also higher for instructional faculty and staff who taught both undergraduate and graduate students than for those who taught only undergraduates.

Teaching and Technology Use

Instructional faculty and staff at degree-granting institutions reported on the volume of e-mail use and how they used course-specific Web sites in fall 1998. Both full- and part-time instructional faculty and staff reported spending an average of 2.7 hours per week responding to students' e-mail communications. Instructional faculty and staff who used course-specific Web sites were more likely to use these Web sites to post general class information and links to other information than for any of the other purposes examined (i.e., posting homework, practice exams/exercises, or exams/exam results) (figure B).

There was an association between type of institution and telecommunications technology use. Among full-time instructional faculty and staff who used e-mail to communicate with students in fall 1998, those at 4-year doctoral institutions reported that an average of 39 percent of their students e-mailed them, compared with 29 percent of students at 4-year nondoctoral institutions and 22 percent of students at 2-year institutions. Similarly, among part-time instructional faculty and staff who used e-mail, those at 2-year institutions reported that an average of 23 percent of their students e-mailed them, compared with 40 percent of students at 4-year doctoral institutions and 34 percent of students at 4-year nondoctoral institutions.

Figure B.—Among postsecondary instructional faculty and staff who used course-specific Web sites, percentage using Web sites for various teaching purposes, by employment status: Fall 1998



NOTE: This figure includes only instructional faculty and staff who taught one or more classes for credit and who also used course-specific Web sites.

SOURCE: U.S. Department of Education, National Center for Education Statistics, 1999 National Study of Postsecondary Faculty (NSOPF:99).

At 4-year doctoral institutions, 85 percent of full-time and 84 percent of part-time instructional faculty used course-specific Web sites for the purpose of posting general class information, compared with 75 percent of both full- and part-time faculty at 2-year institutions.

Workload and Technology Use

Compared with those who did not use telecommunications technologies, full- and part-time instructional faculty and staff who used e-mail or course-specific Web sites generally reported working more hours per week on average, spending more time on research activities, and spending less time on teaching activities and office hours.

Hours Worked

In fall 1998, full-time instructional faculty and staff worked an average of 53 hours per week, and part-time instructional faculty and staff worked an average of 37 hours per week. Full-time instructional faculty and staff who used either e-mail or course-specific Web sites worked more hours per week on average (55 hours) compared with those who did not use e-mail (50 hours) or did not use course-specific Web sites (52 hours). Among part-time instructional faculty and staff, those who used e-mail worked an average of 39 hours per week, compared with 36 hours per week for those who did not use e-mail. Part-time faculty who used course-specific Web sites worked 43 hours per week, compared with 34 hours per week of those who did not use course-specific Web sites. This relationship between hours worked per week and use or non-use of e-mail and course-specific Web sites was generally found in all types of institutions with the following exceptions: no difference was found in work hours between full-time faculty who used course-specific Web sites and those who did not use them at 4-year doctoral institutions, and between part-time faculty who used e-mail and those who did not use it at 4-year nondoctoral and 2-year institutions.

Work Activities

In fall 1998, full-time instructional faculty and staff spent an average of 60 percent of their time on teaching activities, 14 percent on research activities, 13 percent on administrative duties, and 13 percent on other activities. Part-time instructional faculty and staff spent an average of 63 percent of their time on teaching activities, 5 percent on research activities, 3 percent on administrative duties, and 29 percent on other activities. Compared with those at 4-year nondoctoral and 2-year institutions, both full- and part-time instructional faculty and staff at 4-year doctoral institutions spent less of their time on teaching activities and more of their time on research. Overall, postsecondary instructional faculty and staff who used e-mail or course-specific Web sites reported spending more time on research activities; those who did not use these resources reported spending a larger percentage of their time on teaching activities. However, this pattern was not generally found when taking into account type of institution. Full-time instructional faculty and staff at 4-year doctoral institutions who used e-mail reported spending more of their time on teaching activities (51 percent) compared with those who did not use e-mail (48 percent). They also spent more of their time on research activities (23 percent) compared with those who did not use e-mail (20 percent).

Classroom Contact Hours and Office Hours

Full-time instructional faculty had an average of 321 student classroom contact hours per week,[4] and part-time instructional faculty had about 176 student classroom contact hours per week. Full-time instructional faculty who used e-mail to communicate with students reported fewer average classroom contact hours (306 hours per week) than their colleagues who did not do so (353 hours per week). The average number of office hours per week was 6.5 hours for full-time instructional faculty and 2 hours for part-time faculty. The average number of office hours for full-time faculty who used e-mail (6.3 hours) was slightly lower than for those who did not use e-mail (7 hours).

Conclusion

In fall 1998, access to the Internet was common for postsecondary instructional faculty and staff. In addition, 69 percent of full-time faculty and 46 percent of part-time faculty used e-mail to communicate with students in their classes, and about one-third of both full- and part-time faculty used course-specific Web sites.

While the overall findings in this report indicate increasing integration of telecommunications technologies in postsecondary settings, there are three caveats. First, this study showed wide differences between full- and part-time faculty in access to and use of telecommunications technologies. Without exception, full-time faculty reported more access to the Internet and more use of e-mail and course-specific Web sites than did part-time faculty.

Second, Internet access and the quality of computing resources were important factors in the use of telecommunications technologies. Postsecondary instructional faculty and staff who had access to the Internet both at home and at work were significantly more likely to use e-mail and course-specific Web sites than those who had access only at home or only at work. Clearly, the amount of Internet access was a main indicator of use for both e-mail and course-specific Web sites, and it remained important after controlling for other variables. After controlling for other variables, the quality of computing resources also remained a significant factor in the likelihood of using course-specific Web sites: overall, instructional faculty and staff who rated their institution's computing resources as good or excellent were more likely to use course-specific Web sites than were those who rated the computing resources as poor.

Finally, the type of institution was shown repeatedly to be a key factor. In particular, postsecondary instructional faculty and staff at 4-year doctoral institutions were significantly more likely to use e-mail and course-specific Web sites than those at 4-year nondoctoral or 2-year institutions.

[4]Total student contact hours were calculated as follows: For each for-credit class taught (a maximum of 5 classes could be reported by respondents), the number of hours per week spent teaching the class was multiplied by the number of students in the class. The products were then summed to obtain the total number of student classroom contact hours.

Foreword

This report provides descriptive information about instructional faculty and staff who have access to and use telecommunications technologies. This report is based on a nationally representative faculty sample from the 1999 National Study of Postsecondary Faculty (NSOPF:99). The report first describes the academic and demographic characteristics of instructional faculty and staff, identifying those who have access to the Internet and who use electronic mail (e-mail) and course-specific Web sites in their classes. It then goes on to describe the relationship between teaching and technology use by instructional faculty and staff.

The estimates presented in this report (mostly percentages) were produced using the NCES Data Analysis System (DAS), a microcomputer application that allows users to specify and generate tables for the NSOPF:99 study. The DAS produces the design-adjusted standard errors necessary for testing the statistical significance of differences in the estimates. For more information on the DAS, readers should consult appendix B of this report.

The report is one of many reports based on NSOPF:99 data that are currently undertaken or planned. Topics of other reports include: faculty and staff who taught undergraduates; distance education taught by faculty; minority and women faculty; part-time faculty; retirement and other departure plans of faculty; changes in the racial/ethnic and gender make-up of faculty; changes in the tenure status of faculty; and institutional policies and practices regarding faculty in degree-granting institutions. For access to these reports as they become available, go to the NSOPF Web site at *http://nces.ed.gov/surveys/nsopf.*

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Introduction

Electronic mail, the Internet, and Web sites are rapidly becoming core components of the instructional experience of students in the United States. The availability of these resources in elementary, secondary, and postsecondary schools has increased steadily since the early 1990s (Green 1998; Williams 2000). By the late 1990s, over 75 percent of public school students in grades 1 through 12 used the Internet at school, and almost 40 percent of public school teachers with access to computers or the Internet indicated that they use information technology "a lot" to create instructional materials (Rowand 2000; U.S. Department of Education 2000).

Though the availability of information technology is becoming common at all levels of education, little is known about postsecondary instructors' access to and use of the Internet and other telecommunications technologies. Recent surveys of academic-computing officials at over 500 postsecondary institutions have shown that more than 40 percent of senior information technology officials believe that their top priorities, and biggest challenges, are getting faculty to work with technology and helping them to integrate technology with instruction (Carlson 2000; Green 1999). As the typical college has doubled its spending on information technology services over the past 10 years, it becomes increasingly important to know whether or not postsecondary faculty are using electronic mail, the Internet, and Web sites for instructional purposes (Smallen and Leach 2000).

In addition to concerns about the use of information technology, educational planners have been particularly interested in understanding more about the characteristics of postsecondary faculty who teach with technology (Smallen and Leach 2000). For example, studies of the relationship between age and technology use have been considered key to understanding the integration of new technologies in education, but the results have been mixed. On the one hand, a recent NCES report on public elementary and secondary education suggested that newer teachers were more likely than more experienced teachers to use information technologies for a wide variety of instructional activities, including teaching, record keeping, communicating with students and colleagues, and research (Rowand 2000). On the other hand, a recent forum on technology use in higher education found that, due to a pervasive skepticism among faculty and administrators about the quality and effectiveness of online research and teaching, established professors were more inclined than their untenured counterparts to use information technology in teaching (Kiernan 2000).

Given the lack, and often conflicting nature, of information on technology use in higher education, an examination of the use of telecommunications technology by postsecondary instructional faculty and staff offers potentially valuable insight into the integration of new technologies in education. Despite the growing attention paid to this issue, little descriptive information exists at the national level to inform basic questions about technology use and teaching in postsecondary education. The purpose of this report is to answer the following questions: *Who has access to telecommunications technologies, such as electronic mail and the Internet? Who uses it for instructional purposes and how much do they use it?*

Data

Data reported here are from the 1999 National Study of Postsecondary Faculty (NSOPF:99). NSOPF:99 was designed to provide a nationally representative profile of faculty and staff in U.S. 2- and 4-year degree-granting institutions (Zimbler 2001). The survey included items on the activities and instructional duties of postsecondary faculty and instructional staff during the 1998 Fall Term (i.e., whatever academic term was in progress on November 1, 1998). It was designed for both full-time and part-time faculty and instructional staff in 2- and 4-year degree-granting postsecondary institutions of all types and sizes.[1] Faculty and instructional staff participating in NSOPF:99 were asked a series of questions regarding the availability, quality, and use of advanced telecommunication technologies, including access to the Internet,[2] quality of computing resources at their institution, use of electronic mail (e-mail), approximate percentage of students in class who communicated via e-mail, hours per week spent responding to student e-mail, and the use and specific purposes of course-specific Web sites.

Since the purpose here is to provide information on the extent to which postsecondary faculty had access to and used telecommunications technologies for instructional purposes, this analysis includes only those respondents who were on the faculty, or were staff who had some instructional duties even if they did not have faculty status, and reported teaching one or more classes for credit in fall 1998. There were about 1,074,000 faculty and instructional staff employed by public and private not-for-profit 2-year-and-above degree-granting postsecondary institutions in fall 1998. Of these, about 976,000 reported having some instructional responsibilities for credit, including teaching classes for credit or advising students about academic activities for credit. Among these individuals, approximately 90 percent, or 882,000 (501,000 full-time and 381,000 part-time), reported teaching one or more classes for credit in fall 1998. These individu-

[1]The sample did not include institutions that either (1) offered only less-than-2-year programs, (2) were private for-profit, or (3) were located outside the United States (for example, in U.S. territories). In addition, it excluded institutions that offer instruction only to employees of the institutions, tribal colleges, and institutions that offer only correspondence courses.

[2]The term "access" was not specifically defined for the respondents of NSOPF:99.

als become the core sample of this report. In the interest of brevity, these individuals are referred to as "instructional faculty and staff," "instructional faculty," or simply "faculty" throughout this report, although they are a subset of faculty and instructional staff included in the NSOPF:99.

Organization of the Report

This report contains two main sections. The first section examines the relationship of various characteristics of postsecondary instructional faculty and staff and the institutions in which they taught according to their access to the Internet, quality of computing resources, and use of telecommunications technologies (e-mail, and course-specific Web sites). Faculty characteristics include social and demographic background, such as gender, race/ethnicity, and age, as well as characteristics that define their academic profession, such as academic rank, employment status, level of students taught, principal field of teaching, and tenure status. Availability, quality, use of telecommunications technologies, and type of institution[3] where these postsecondary faculty and staff taught is also investigated.

The second section of the report provides information concerning the relationship between teaching and technology use by instructional faculty and staff who taught classes for credit. It focuses on the volume and purposes of technology use in teaching and on the relationship between technology use and teaching loads of instructional faculty and staff. Five key indicators of teaching load are examined: average number of hours worked per week; average percentage of time spent on teaching, research, administration, and other/service activities; total number of hours per week teaching students in the classroom, total student contact hours inside the classroom; and average office hours per week.

Finally, because full-time and part-time faculty differ widely on most characteristics, analyses were conducted—and are reported—separately by employment status.

The report addresses the following questions:

Access to the Internet, quality of computing resources, and use of telecommunications technologies:

- Who has access to the Internet, and where do they have it?

[3]Because a consistent pattern of difference was found between 2- and 4-year institutions—and the original nine categories of institution type showed no consistent association with the availability or use of telecommunications technologies—the nine categories of institution type were aggregated into the following three: 4-year doctoral, 4-year nondoctoral, and 2-year institutions. Four-year doctoral institutions include public and private research and doctorate-granting institutions. Four-year nondoctoral institutions include public and private comprehensive institutions, public and private liberal arts, and other public and private specialized institutions. Two-year institutions include both public and private 2-year colleges.

- How do instructional faculty and staff rate the quality of computing resources at their institutions?
- Who is more likely to use course-specific Web sites or e-mail for course-specific communication?
- What is the relationship between the availability and quality of computing resources to instructional faculty and staff's use of e-mail and course-specific Web sites?

Teaching and technology use:

- What is the volume of course-specific e-mail communication with students?
- For what purposes did faculty use course-specific Web sites?
- How do those who use e-mail or course-specific Web sites differ in their face-to-face contact with students inside and outside the classroom from those who do not?

A multivariate analysis of the relationship of the availability and quality of computing resources to instructional faculty and staff's use of e-mail and course-specific Web sites is included. The multivariate analysis controls for selected academic and demographic variables such as age, gender, race/ethnicity, academic rank, type of institution, level of students taught, principal field of teaching, and tenure status.

Profile of Instructional Faculty and Staff Who Taught Classes for Credit

To what extent did instructional faculty and staff have access to and use telecommunications technologies for instructional purposes? Before investigating these issues, it is important to examine the characteristics of instructional faculty and staff who provided classroom instruction for credit to various levels of students. In fall 1998, instructional faculty and staff were primarily men (59 percent) and White, non-Hispanic (86 percent). The model age of this group was between 45 and 54 years old. Instructional faculty and staff were more likely to teach only undergraduates (74 percent) than to teach only graduate students (15 percent) or both undergraduate and graduate students (11 percent). They were also more likely to teach in the fields of health sciences (12 percent), humanities (17 percent), and the social sciences (15 percent) than other teaching fields.

These overall estimates, however, mask differences across full- and part-time employment status. Figure 1 shows that, among postsecondary instructional faculty and staff who taught classes for credit, those who were full-time faculty were more likely to be employed at 4-year doctoral (42 percent) and nondoctoral institutions (38 percent) than 2-year institutions (20 percent). Of full-time instructional faculty and staff at degree-granting institutions, faculty members were also more likely to hold the rank of full professor (31 percent) than any other rank (7 to 24 percent) and over one-half were tenured (54 percent) (table 1). On the other hand, part-time instructional faculty and staff were more likely to be employed at 2-year institutions (43 percent) and 4-year nondoctoral institutions (36 percent) than 4-year doctoral institutions (21 percent) (figure 1). A majority of part-time instructional faculty and staff were instructors/lecturers (62 percent) and were neither tenured nor on the tenure track (95 percent) (table 1). Because full- and part-time faculty differ widely on many characteristics examined, the following analyses are conducted and reported separately by employment status. The next section examines faculty's access to the Internet, their opinion of the institution's computing resources, and their use of telecommunication technologies such as e-mail and course-specific Web sites for instructional purposes.

Table 1.—Percentage distribution of full- and part-time postsecondary instructional faculty and staff according to selected demographic and academic characteristics: Fall 1998

	Total	Full-time	Part-time
Total	100.0	100.0	100.0
Age			
Under 35	9.8	7.4	13.1
35–44	25.1	24.9	25.5
45–54	35.3	36.0	34.3
55–64	22.7	26.3	18.1
65 or older	7.0	5.5	9.0
Gender			
Male	58.7	63.9	51.9
Female	41.3	36.1	48.1
Race/ethnicity			
American Indian/Alaska Native	0.8	0.8	1.0
Asian/Pacific Islander	4.5	5.6	3.1
Black, non-Hispanic	5.0	5.2	4.7
Hispanic	3.6	3.3	3.9
White, non-Hispanic	86.1	85.1	87.4
Academic rank			
Full professor	20.5	30.9	7.0
Associate professor	15.3	23.7	4.3
Assistant professor	14.8	22.3	4.9
Instructor/lecturer	36.1	16.5	61.9
Other ranks/not applicable	13.3	6.7	21.9
Level of students taught[1]			
Undergraduate only	73.9	66.6	83.7
Undergraduate and graduate	11.3	16.4	4.4
Graduate only	14.8	17.0	11.9
Principal field of teaching[2]			
Business	7.8	7.6	8.1
Education	7.8	7.6	8.1
Engineering and computer sciences	8.3	8.7	7.7
Fine arts	7.8	6.6	9.4
Health sciences	11.5	13.0	9.5
Human services	5.0	4.7	5.5
Humanities	16.8	15.4	18.5
Life sciences	5.7	7.7	3.1
Natural/physical sciences and mathematics	9.5	10.3	8.6
Social sciences	14.9	14.3	15.7
Vocational fields	4.0	3.7	4.4
Tenure status			
Tenured	32.3	54.0	3.8
On tenure track	11.6	19.3	1.4
No tenure[3]	56.1	26.7	94.8

[1]Based on reports of the primary level of students taught in up to five for-credit classes.

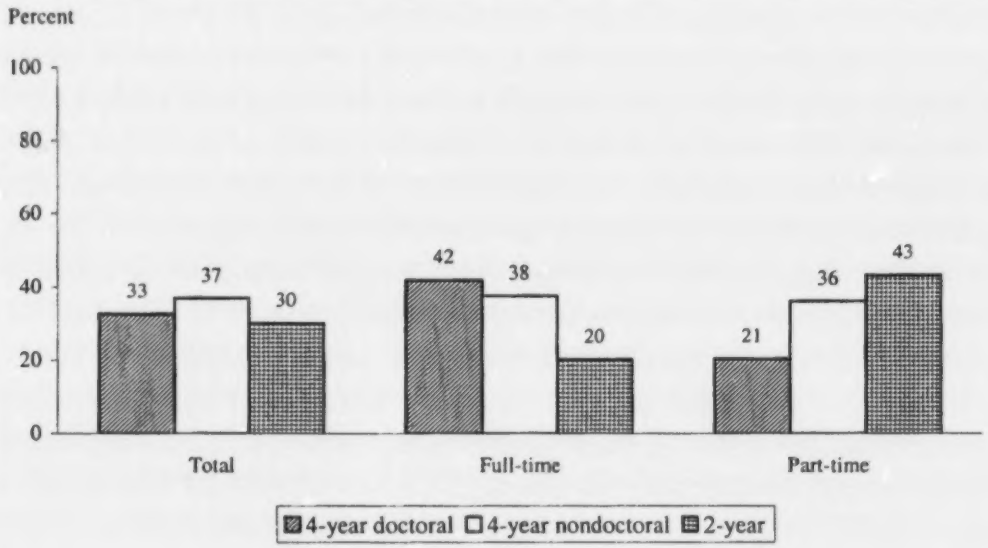
[2]Included in the total but not shown separately are those who did not specify a principal field of teaching.

[3]This group includes those not on tenure track or those at institutions with no tenure system.

NOTE: This table includes only instructional faculty and staff who taught one or more classes for credit. Details may not sum to 100 due to rounding.

SOURCE: U.S. Department of Education, National Center for Education Statistics, 1999 National Study of Postsecondary Faculty (NSOPF:99).

Figure 1.—Percentage distribution of postsecondary instructional faculty and staff according to type of institution, by employment status: Fall 1998



NOTE: This figure includes only instructional faculty and staff who taught one or more classes for credit.

SOURCE: U.S. Department of Education, National Center for Education Statistics, 1999 National Study of Postsecondary Faculty (NSOPF:99).

Access to the Internet, Quality of Computing Resources, and Use of Telecommunications Technologies

Student and faculty use of telecommunications technologies may have much to do with the availability and quality of an institution's technology infrastructure. The next four sections explore this assumption by examining instructional faculty and staff's access to the Internet, their opinion of the institution's computing resources, their use of e-mail and course-specific Web sites, and the relationship of availability and quality of computing resources to use of telecommunications technologies.

Access to the Internet

Access to the Internet was very common for full-time postsecondary instructional faculty and staff with classroom instructional duties in fall 1998. A total of 97 percent of full-time instructional faculty and staff had access to the Internet (table 2). Further, 61 percent of full-time and 46 percent of part-time instructional faculty and staff had access to the Internet both at home and at work. Among full-time faculty, this was greater than the proportion who had access only at work (32 percent) or only at home (4 percent).

Access to the Internet was also related to age. As the age of full-time instructional faculty and staff increased, the percentage of those who had access to the Internet decreased. For example, among full-time instructional faculty and staff, those who were 65 years or older were less likely (89 percent) than all other age groups (96 to 99 percent) to have access to the Internet, and were less likely to have access both at home and at work (39 percent) compared with other age groups (58 to 65 percent).

Though part-time instructional faculty and staff were less likely to have access to the Internet than their full-time counterparts, a large majority of part-time instructional faculty and staff at degree-granting institutions had access to the Internet in fall 1998 (88 percent). Like their full-time counterparts, part-time instructional faculty and staff were more likely to have access both at home and at work (46 percent) than at work only (19 percent) or at home only (23 percent). Among part-time instructional faculty and staff, those who were 65 years or older were less likely

Table 2.—Percentage distribution of full- and part-time postsecondary instructional faculty and staff according to where they had access to the Internet, by selected demographic and academic characteristics: Fall 1998

	Access to the Internet							
	Full-time				Part-time			
	Any access	Both at home and work	At work only	At home only	Any access	Both at home and work	At work only	At home only
Total	96.7	60.8	31.9	4.0	87.8	46.1	19.2	22.6
Age								
Under 35	99.0	64.3	32.5	2.2	90.3	39.8	23.9	26.6
35–44	97.7	61.7	32.2	3.7	89.4	49.4	17.4	22.6
45–54	97.3	64.8	27.8	4.7	90.2	50.0	17.2	23.0
55–64	95.9	58.0	34.2	3.7	86.5	44.0	20.6	22.0
65 or older	88.5	38.9	45.7	3.9	73.2	34.9	22.0	16.3
Gender								
Male	96.8	63.0	30.9	2.9	88.0	49.8	19.9	18.3
Female	96.5	56.9	33.7	5.9	87.6	42.0	18.4	27.2
Race/ethnicity								
American Indian/Alaska Native	98.8	49.0	48.3	1.5	87.2	53.8	18.7	14.7
Asian/Pacific Islander	97.2	64.2	30.0	3.1	88.3	53.5	20.2	14.6
Black, non-Hispanic	92.9	48.5	37.5	6.9	84.8	40.8	26.2	17.8
Hispanic	98.5	63.0	32.8	2.7	86.6	41.5	20.1	25.0
White, non-Hispanic	96.8	61.3	31.5	3.9	88.0	46.2	18.7	23.1
Academic rank								
Full professor	96.6	63.7	30.2	2.8	86.6	49.6	22.2	14.9
Associate professor	97.4	63.7	29.6	4.1	91.4	54.0	15.2	22.3
Assistant professor	97.9	59.5	35.0	3.5	88.5	49.6	18.5	20.5
Instructor/lecturer	94.8	54.9	33.5	6.4	87.5	45.0	19.8	22.7
Other ranks/not applicable	95.1	56.0	34.0	5.1	88.2	45.6	17.4	25.2
Level of students taught[1]								
Undergraduate only	96.1	57.6	34.1	4.4	86.9	43.7	19.9	23.3
Undergraduate and graduate	98.4	66.0	29.6	2.9	94.2	61.3	16.0	16.8
Graduate only	97.4	68.2	25.6	3.6	91.4	56.7	15.1	19.7

See footnotes at end of table.

Table 2.—Percentage distribution of full- and part-time postsecondary instructional faculty and staff according to where they had access to the Internet, by selected demographic and academic characteristics: Fall 1998—Continued

	Had access to the Internet							
	Full-time				Part-time			
	Any access	Both at home and work	At work only	At home only	Any access	Both at home and work	At work only	At home only
Principal field of teaching[2]								
Business	97.8	66.6	27.7	3.6	92.1	63.3	13.3	15.5
Education	98.5	62.2	30.2	6.0	85.8	46.7	18.4	20.7
Engineering and computer sciences	99.3	74.7	23.3	1.3	98.9	75.3	14.9	8.7
Fine arts	93.1	51.3	34.3	7.5	75.5	25.3	14.0	36.1
Health sciences	96.9	63.5	28.2	5.3	87.8	49.5	12.1	26.2
Human services	94.0	56.2	34.1	3.7	84.4	34.7	17.8	31.9
Humanities	95.3	53.5	37.0	4.8	85.7	37.9	23.6	24.1
Life sciences	97.2	59.8	35.8	1.6	86.6	41.3	22.7	22.7
Natural/physical sciences and mathematics	98.5	61.2	34.4	3.0	91.1	48.4	25.2	17.6
Social sciences	96.8	62.9	31.6	2.3	91.5	45.7	21.4	24.5
Vocational fields	92.7	51.2	33.7	7.7	88.5	50.7	25.0	12.8
Tenure status								
Tenured	96.5	62.1	31.1	3.3	87.9	50.3	21.0	16.6
On tenure track	98.1	60.7	34.2	3.3	91.0	44.7	19.4	26.9
No tenure[3]	95.9	58.2	31.9	5.8	87.7	45.9	19.1	22.8

[1]Based on reports of the primary level of students taught in up to five for-credit classes.

[2]Included in the total but not shown separately are those who did not specify a principal field of teaching.

[3]This group includes those not on tenure track or those at institutions with no tenure system.

NOTE: This table includes only instructional faculty and staff who taught one or more classes for credit. Details may not sum to totals of any access due to rounding.

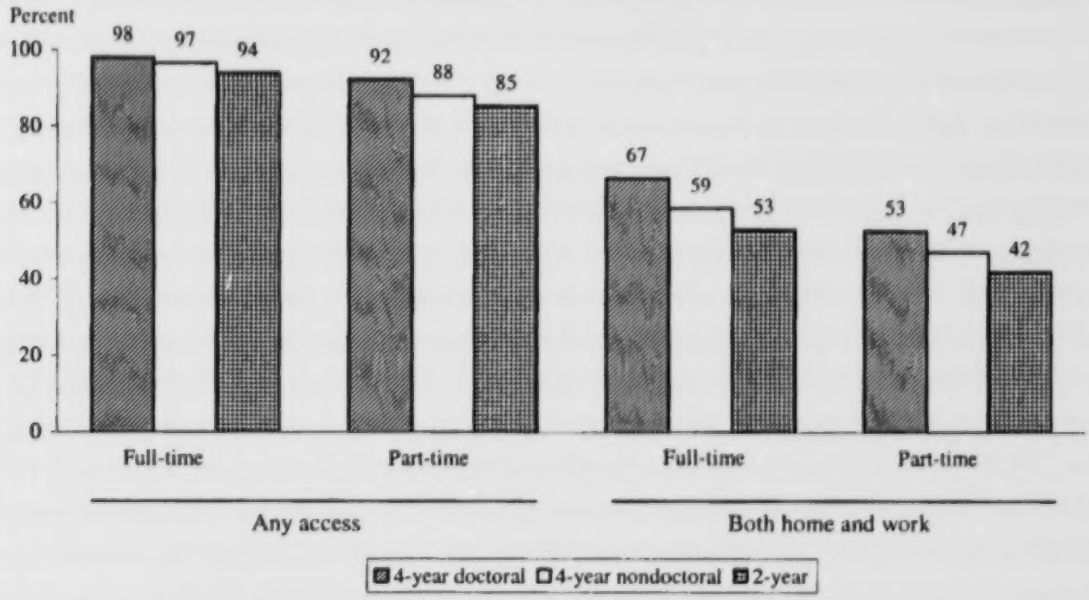
SOURCE: U.S. Department of Education, National Center for Education Statistics, 1999 National Study of Postsecondary Faculty (NSOPF:99).

(73 percent) than all other age groups (87 to 90 percent) to have access to the Internet and were less likely to have access both at home and at work (35 percent) than those who were 35–44 years old (49 percent) and 45–54 years old (50 percent).

In fall 1998, while a large majority of full- and part-time instructional faculty and staff at degree-granting institutions had access to the Internet, the type of institution where they taught was related to the likelihood of access to the Internet (figure 2). Among full-time instructional faculty and staff, those at 4-year institutions were more likely (97–98 percent) than those at 2-year institutions (94 percent) to have access to the Internet. Those at 4-year doctoral institutions (67 percent) were also more likely than those at 4-year nondoctoral (59 percent) and 2-year institutions (53 percent) to have Internet access both at home and at work. The same results were

found for part-time instructional faculty and staff: those at 4-year doctoral institutions were more likely (92 percent) than those at 4-year nondoctoral (88 percent) and 2-year institutions (85 percent) to have access to the Internet. Those at 4-year doctoral institutions were also more likely (53 percent) than those at 2-year institutions (42 percent) to have access both at home and at work.

Figure 2.—Percentage of postsecondary instructional faculty and staff with Internet access, by employment status and institution type: Fall 1998



NOTE: This figure includes only instructional faculty and staff who taught one or more classes for credit.

SOURCE: U.S. Department of Education, National Center for Education Statistics, 1999 National Study of Postsecondary Faculty (NSOPF:99).

Other differences in the availability of Internet resources along other academic and demographic dimensions were found as well (table 2). For example, among full-time instructional faculty and staff who taught classes for credit at degree-granting institutions, men were more likely (63 percent) than women (57 percent) to have access to the Internet both at home and at work, and a higher than average percentage of faculty in the field of engineering/computer sciences had access both at home and at work (75 percent). Compared with those who taught only undergraduates (58 percent), full-time faculty who taught only graduate students (68 percent) or both undergraduate and graduate students (66 percent) were more likely to have access to the Internet

both at home and at work. A larger proportion of full-time instructional faculty and staff with full professor or associate professor status (64 percent for each group) had access to the Internet at home and at work than those who held instructor/lecturer status (55 percent) or other ranks (56 percent). In contrast, full-time Black non-Hispanic faculty were less likely to report access to the Internet (93 percent) and were less likely to have access both at home and at work (49 percent) than other racial/ethnic groups.[4]

As with their full-time counterparts, part-time instructional faculty and staff showed differences in access to the Internet along particular academic and demographic dimensions. Among part-time instructional faculty and staff, men were more likely (50 percent) than women (42 percent) to have access to the Internet both at home and those who taught in the field of engineering and computer sciences were more likely (75 percent) than all part-time faculty (46 percent) to have access both at home and at work. Like full-time faculty, part-time instructional faculty and staff who taught only undergraduates were less likely to have access to the Internet and to have it both at home and at work than those who taught only graduate students or both undergraduate and graduate students.

Quality of Computing Resources

About 46 percent of full-time faculty and 41 percent of part-time faculty who taught classes for credit at degree-granting institutions rated the quality of their institutions' computing resources as good, with an additional one-third of full-time (32 percent) and one-quarter of part-time instructional faculty (25 percent) rating the quality of computing resources as excellent (table 3). In general, academic and demographic characteristics of instructional faculty and staff, such as age, gender, race/ethnicity, academic rank, teaching field, and tenure status, were not associated with the likelihood of rating the quality of institutions' computing resources as poor, fair, good, or excellent. Two exceptions to this overall pattern exist. Full- and part-time instructional faculty and staff who taught only undergraduates were more likely than those who taught both undergraduate and graduate students to rate the quality of their institution's computing resources as poor.

The second exception is the relationship between ratings of quality of computing resources and institution type. Both full- and part-time faculty at 4-year doctoral institutions were less likely than those at 4-year nondoctoral and 2-year institutions to rate the quality of their institution's computing resources as poor (figure 3). However, these differences are relatively small; for example, 2 percent of full-time faculty at 4-year doctoral institutions rated their institution's

[4]Among American Indian/Alaska Native instructional faculty and staff, 49 percent reported access both at home and at work; however, due to large standard errors, this proportion was not significantly different from any other racial/ethnic groups.

Table 3.—Percentage distribution of full- and part-time postsecondary instructional faculty and staff according to quality of institution's computing resources, by selected demographic and academic characteristics: Fall 1998

	Quality of computing resources[1]							
	Full-time				Part-time			
	Poor	Fair	Good	Excellent	Poor	Fair	Good	Excellent
Total	2.9	18.6	46.2	32.3	11.1	23.5	40.9	24.5
Age								
Under 35	2.0	19.1	44.9	34.0	11.9	19.4	41.3	27.5
35–44	2.3	19.8	46.5	31.4	10.2	25.0	42.1	22.7
45–54	3.7	17.9	45.5	33.0	11.4	26.2	40.3	22.1
55–64	2.7	18.3	46.5	32.6	11.2	20.5	41.9	26.4
65 or older	3.5	18.5	50.5	27.4	11.4	21.1	37.0	30.5
Gender								
Male	2.6	17.7	46.9	32.8	11.0	23.6	39.7	25.6
Female	3.6	20.1	45.1	31.2	11.2	23.4	42.1	23.3
Race/ethnicity								
American Indian/Alaska Native	2.0	30.3	37.8	29.9	(#)	(#)	(#)	(#)
Asian/Pacific Islander	4.0	21.5	42.6	31.9	8.2	31.7	31.2	28.9
Black, non-Hispanic	3.6	22.5	45.3	28.6	15.0	22.4	37.7	24.8
Hispanic	3.9	17.9	50.0	28.2	11.0	21.5	37.0	30.5
White, non-Hispanic	2.8	18.1	46.5	32.7	11.1	23.2	41.7	24.1
Academic rank								
Full professor	2.5	16.4	48.9	32.2	6.7	19.4	40.5	33.4
Associate professor	3.3	17.7	46.4	32.7	6.7	25.1	34.5	33.7
Assistant professor	3.0	19.9	47.1	30.0	7.3	24.5	43.0	25.2
Instructor/lecturer	3.1	20.1	42.5	34.4	10.9	22.8	43.1	23.2
Other ranks/not applicable	3.1	24.0	39.7	33.2	15.2	26.5	35.3	23.0
Institution type								
4-year doctoral	1.8	15.8	47.4	35.0	7.6	24.9	42.6	24.9
4-year nondoctoral	3.0	20.4	47.2	29.4	11.2	22.4	38.5	27.9
2-year	5.0	20.8	42.1	32.1	12.8	23.7	42.0	21.6
Level of students taught[2]								
Undergraduate only	3.4	19.2	45.5	32.0	11.7	22.5	41.9	23.9
Undergraduate and graduate	1.2	18.3	47.4	33.0	6.4	31.6	29.9	32.2
Graduate only	2.7	16.5	48.3	32.6	9.0	27.5	38.0	25.5

See footnotes at end of table.

Table 3.—Percentage distribution of full- and part-time postsecondary instructional faculty and staff according to quality of institution's computing resources, by selected demographic and academic characteristics: Fall 1998—Continued

	Quality of computing resources[1]							
	Full-time				Part-time			
	Poor	Fair	Good	Excellent	Poor	Fair	Good	Excellent
Principal field of teaching[3]								
Business	3.8	17.3	48.7	30.2	12.7	19.9	37.6	29.7
Education	2.9	16.0	45.4	35.7	9.4	23.4	39.5	27.7
Engineering and computer sciences	2.0	16.0	49.1	32.8	4.1	26.2	44.3	25.4
Fine arts	3.7	20.5	45.0	30.9	12.7	21.5	42.7	23.0
Health sciences	2.9	17.4	43.9	35.8	10.2	24.4	42.1	23.4
Human services	3.2	16.9	44.6	35.3	14.5	26.1	33.7	25.7
Humanities	3.6	22.2	46.4	27.8	11.3	21.1	43.8	23.9
Life sciences	1.6	15.0	45.8	37.6	11.0	31.2	33.0	24.8
Natural/physical sciences and mathematics	2.5	20.8	48.6	28.1	12.9	20.2	41.7	25.3
Social sciences	2.0	19.6	45.3	33.1	11.5	28.3	41.7	18.6
Vocational fields	4.0	18.9	46.5	30.6	8.4	21.8	33.6	36.2
Tenure status								
Tenured	3.0	16.7	48.1	32.2	4.3	18.0	32.0	45.6
On tenure track	2.4	21.0	47.9	28.7	14.4	23.4	30.2	32.1
No tenure[4]	3.1	20.7	41.2	35.0	11.4	23.7	41.4	23.5

#Too small to report.

[1]Based on average of respondents' ratings (poor, fair, good, excellent) of the institution's personal computers and local networks, centralized (mainframe) computer facilities, Internet connections, and technical support for computer-related activities.

[2]Based on reports of the primary level of students taught in up to five for-credit classes.

[3]Included in the total but not shown separately are those who did not specify a principal field of teaching.

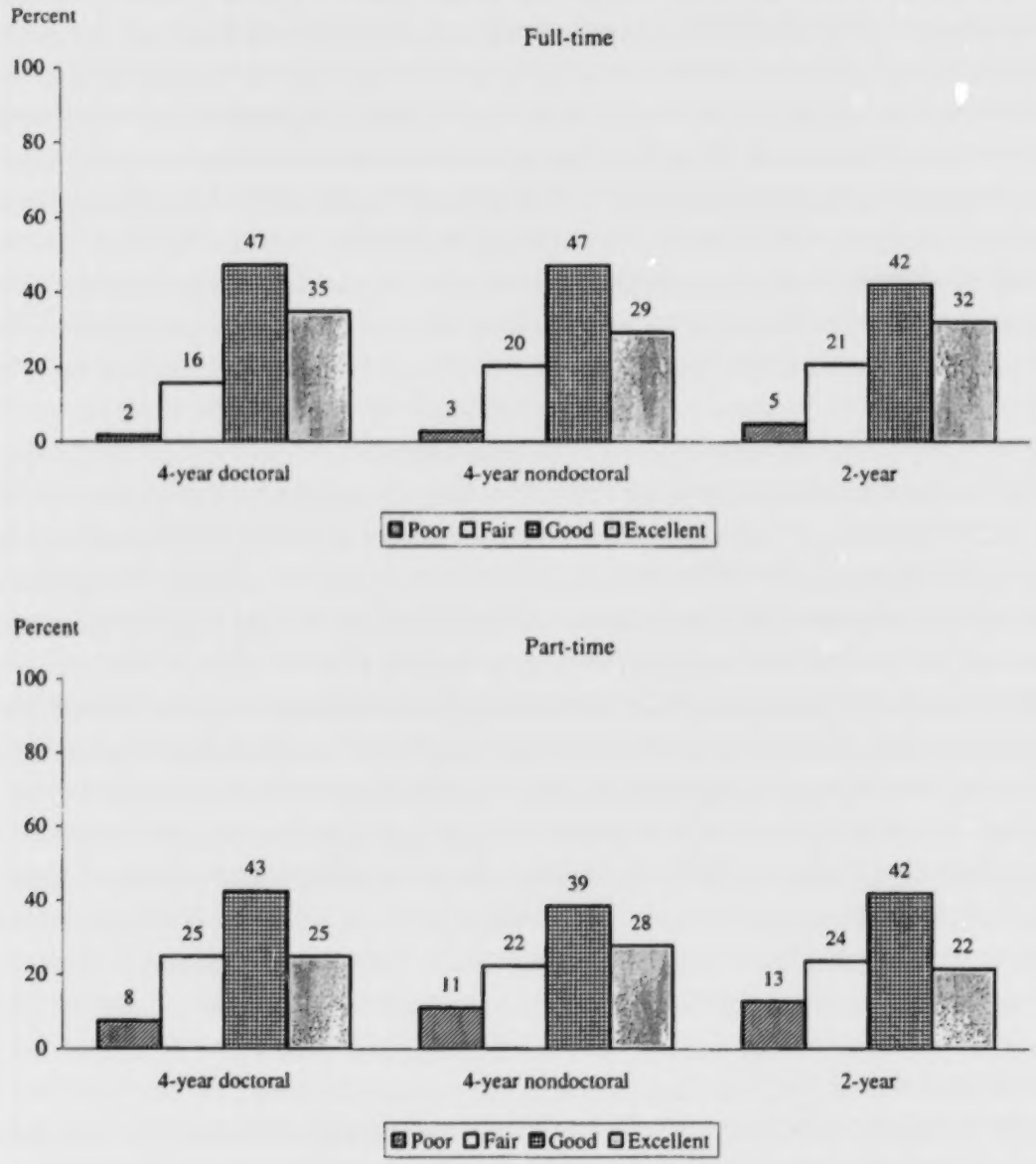
[4]This group includes those not on tenure track or those at institutions with no tenure system.

NOTE: This table includes only instructional faculty and staff who taught one or more classes for credit. Details may not sum to 100 due to rounding.

SOURCE: U.S. Department of Education, National Center for Education Statistics, 1999 National Study of Postsecondary Faculty (NSOPF:99).

computing resources as poor, compared with 3 percent among full-time faculty at 4-year nondoctoral institutions and 5 percent of those at public 2-year institutions. Among full-time instructional faculty and staff, those at 4-year doctoral institutions were also less likely (16 percent) than those at 4-year nondoctoral (20 percent) and 2-year institutions (21 percent) to rate the quality of their institution's computing resources as fair. On the other hand, full-time instructional faculty and staff at 4-year doctoral institutions had a higher likelihood of rating the quality of computing resources as excellent (35 percent) than those at 4-year nondoctoral institutions (29 percent). Full-time instructional faculty and staff at 4-year doctoral institutions were also more likely (47

Figure 3.—Percentage distribution of postsecondary instructional faculty and staff according to quality of computing resources, by employment status and institution type: Fall 1998



NOTE: This figure includes only instructional faculty and staff who taught one or more classes for credit.

SOURCE: U.S. Department of Education, National Center for Education Statistics, 1999 National Study of Postsecondary Faculty (NSOPF:99).

percent) than those at 2-year institutions (42 percent) to rate the quality of computing resources as good. Additionally, among part-time instructional faculty and staff, those at 4-year nondoctoral institutions were more likely (28 percent) than those at 2-year institutions (22 percent) to rate the quality of computing resources as excellent.

Use of Telecommunications Technologies

With e-mail consistently ranked as the number one application used on the Internet, and with widespread access to the Internet for postsecondary instructional faculty and staff, it seems logical that e-mail would be used as a regular form of communication between instructional faculty and their students. Though not as prevalent, this study did find e-mail use among a sizeable percentage of postsecondary instructional faculty and staff in fall 1998: among instructional faculty and staff who taught classes for credit at degree-granting institutions, 69 percent of full-time faculty and 46 percent of part-time faculty reported using e-mail to communicate with students in their classes (table 4). Compared with e-mail, a course-specific Web site was less commonly used by full- and part-time instructional faculty and staff (40 percent and 34 percent). However, those who exchanged e-mail with students were also more likely to use Web sites for their classes. For example, among full-time instructional faculty, 46 percent of those using e-mail also used Web sites, compared with 28 percent of those who did not use e-mail.[5] Overall, full-time instructional faculty and staff were more likely than their part-time counterparts to use e-mail and course-specific Web sites.

Institution type showed a strong relationship with the use of e-mail among instructional faculty and staff (figure 4). Among full-time instructional faculty and staff, those at 4-year institutions had a higher likelihood of using e-mail to communicate with students in their classes than those at 2-year institutions. Full-time faculty at 4-year doctoral institutions were also more likely (78 percent) than those at 4-year nondoctoral (71 percent) to use e-mail to communicate to students. The same results were observed for part-time faculty. Compared with those at 2-year institutions, part-time faculty at 4-year institutions had a higher likelihood of using e-mail to communicate with students in their classes, and those at 4-year doctoral institutions were more likely (63 percent) than those at 4-year nondoctoral (53 percent) to use e-mail. However, in the use of course-specific Web sites, only full-time faculty at 4-year doctoral institutions had a higher likelihood of using course-specific Web sites (45 percent) compared with those at 4-year nondoctoral (38 percent) and 2-year institutions (34 percent). Among part-time faculty, institution type was not associated with use of course-specific Web site.

[5]U.S. Department of Education, National Center for Education Statistics, 1999 National Study of Postsecondary Faculty (NSOPF:99), Data Analysis System.

Table 4.—Percentage of full- and part-time postsecondary instructional faculty and staff who used e-mail and course-specific Web sites, by selected demographic and academic characteristics: Fall 1998

	Used e-mail to communicate with students		Used course-specific Web site	
	Full-time	Part-time	Full-time	Part-time
Total	69.2	46.3	40.4	34.3
Age				
Under 35	76.4	54.5	45.0	36.5
35–44	74.2	50.2	44.9	36.1
45–54	69.7	46.5	39.1	34.8
55–64	65.1	39.6	36.2	32.6
65 or older	54.1	36.5	41.4	27.8
Gender				
Male	71.2	46.6	42.7	36.5
Female	65.8	46.0	36.1	32.0
Race/ethnicity				
American Indian/Alaska Native	72.0	60.5	29.3	44.5
Asian/Pacific Islander	72.0	57.6	45.9	35.7
Black, non-Hispanic	53.9	38.0	49.0	39.5
Hispanic	69.3	48.8	49.0	39.5
White, non-Hispanic	70.0	46.1	39.2	33.6
Academic rank				
Full professor	71.5	39.3	40.9	52.6
Associate professor	74.1	47.0	41.9	35.0
Assistant professor	73.1	48.3	43.1	35.8
Instructor/lecturer	58.4	44.8	38.3	35.9
Other ranks/not applicable	55.4	52.3	28.3	23.6
Institution type				
4-year doctoral	77.8	63.4	45.1	39.0
4-year nondoctoral	70.9	52.7	38.4	33.6
2-year	48.5	33.0	34.2	32.7
Level of students taught[1]				
Undergraduate only	66.1	43.7	38.7	33.7
Undergraduate and graduate	80.7	64.9	48.9	50.0
Graduate only	70.6	57.8	38.7	32.7

See footnotes at end of table.

Table 4.—Percentage of full- and part-time postsecondary instructional faculty and staff who used e-mail and course-specific Web sites, by selected demographic and academic characteristics: Fall 1998—Continued

	Used e-mail to communicate with students		Used course-specific Web site	
	Full-time	Part-time	Full-time	Part-time
Principal field of teaching[2]				
Business	74.6	57.6	44.5	41.8
Education	75.3	51.3	43.5	26.6
Engineering and computer sciences	82.3	65.4	57.9	41.4
Fine arts	59.7	31.7	38.2	34.8
Health sciences	51.0	30.0	33.0	34.1
Human services	63.2	32.7	31.4	28.0
Humanities	69.9	49.9	38.0	34.4
Life sciences	71.8	45.6	39.9	23.6
Natural/physical sciences and mathematics	73.1	45.3	40.8	33.0
Social sciences	79.3	50.4	38.3	32.3
Vocational fields	49.1	46.2	43.8	52.5
Tenure status				
Tenured	70.5	43.8	40.7	37.2
On tenure track	75.8	36.6	42.6	40.0
No tenure[3]	61.9	46.6	38.0	34.1

[1]Based on reports of the primary level of students taught in up to five for-credit classes.

[2]Included in the total but not shown separately are those who did not specify a principal field of teaching.

[3]This group includes those not on tenure track or those at institutions with no tenure system.

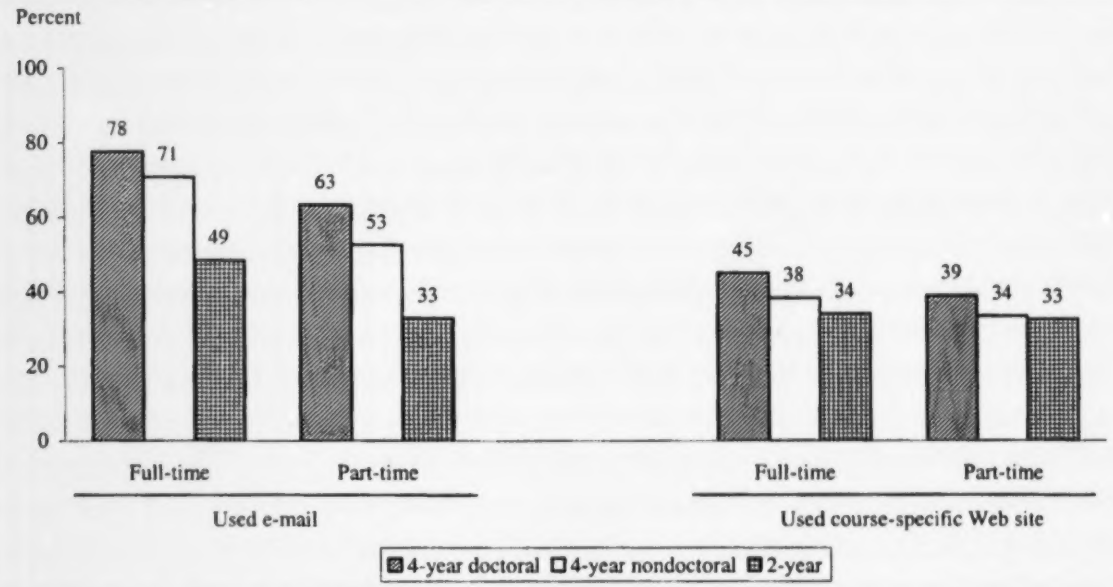
NOTE: This table includes only instructional faculty and staff who taught one or more classes for credit.

SOURCE: U.S. Department of Education, National Center for Education Statistics, 1999 National Study of Postsecondary Faculty (NSOPF:99).

Instructional faculty's use of e-mail was also related to specific academic and demographic characteristics. For example, the use of e-mail to communicate with students was related to the age, gender, and race/ethnicity of instructional faculty and staff. As the age of both full- and part-time instructional faculty and staff increased, the use of e-mail decreased (table 4). Among full-time instructional faculty and staff, women were less likely (66 percent) than men (71 percent) to use e-mail to communicate with students, and a lower proportion of full-time Black, non-Hispanic instructional faculty and staff used e-mail (54 percent) than their White, non-Hispanic, Asian/Pacific Islander, and Hispanic counterparts (69 to 72 percent). These gender and racial/ethnic differences were not observed among part-time instructional faculty and staff.

The academic rank, tenure status, level of students taught and principal field of teaching of instructors were also related to the likelihood of e-mail use. Among full-time instructional faculty

Figure 4.—Percentage of postsecondary instructional faculty and staff who used e-mail and course-specific Web sites, by employment status and institution type: Fall 1998



NOTE: This figure includes only instructional faculty and staff who taught one or more classes for credit.

SOURCE: U.S. Department of Education, National Center for Education Statistics, 1999 National Study of Postsecondary Faculty (NSOPF:99).

and staff who taught classes for credit at degree-granting institutions, those with instructor/lecturer (58 percent) or other ranks (55 percent) were less likely to use e-mail to communicate with students than those with assistant professor (73 percent), associate professor (74 percent), or full professor status (72 percent). A larger proportion of full-time faculty on the tenure track also used e-mail to communicate with students in their classes (76 percent) compared with those who had tenure (71 percent) and those who were not on tenure track (62 percent).

In addition, of full-time instructional faculty and staff who taught for-credit classes in fall 1998, those who taught both undergraduate and graduate students were more likely to use e-mail to communicate with students in their classes (81 percent) than those who taught only undergraduates (66 percent) or only graduate students (71 percent). Among part-time instructional faculty and staff, those who taught only undergraduate students were less likely to use e-mail (44 percent) than those who taught both undergraduate and graduate students (65 percent). Principal field of teaching also made a difference. At degree-granting institutions, 69 percent of full-time faculty and 46 percent of part-time faculty used e-mail to communicate with students, as noted above. At degree-granting institutions, 82 percent of full-time and 65 percent of part-time engineering/computer science instructional faculty and staff used e-mail to communicate with stu-

dents. About 51 percent of full-time and 30 percent of part-time health sciences faculty used e-mail to communicate with students.

As with the use of e-mail, full-time instructional faculty's use of course-specific Web sites was related to age, gender, race/ethnicity, level of students taught, and principal field of teaching. Of full-time instructional faculty and staff, those who were 35–44 years old were more likely to use a course-specific Web site (45 percent) than those who were between 45–54 (39 percent) or between 55–64 years old (36 percent), and a larger proportion of full-time Black, non-Hispanic faculty used a course-specific Web site (49 percent) than their White, non-Hispanic (39 percent) and American Indian/Alaska Native counterparts (29 percent). Full-time female faculty were also less likely than their male counterparts to use Web sites (36 versus 43 percent). However, differences in the use of course-specific Web sites by age, gender, and race/ethnicity were not found among part-time instructional faculty and staff. Moreover, full- and part-time instructional faculty and staff who taught both undergraduate and graduate students were more likely to use course-specific Web sites than those who taught only undergraduates or only graduate students. Finally, a higher than average percentage of full-time instructional faculty and staff who taught engineering/computer sciences used a course-specific Web site (58 percent).

Relationship Between Access to and Quality of Computing Resources to Instructional Use

As shown in table 5, full- and part-time instructional faculty and staff's use of telecommunications technologies was associated with the extent of their access to the Internet. Compared with those who had access only at work or only at home, instructional faculty and staff who had access both at home and at work were more likely to use e-mail to communicate with students in their classes and were more likely to use course-specific Web sites. Of those who had access to the Internet both at home and at work, full-time instructional faculty and staff were more likely to use e-mail (78 percent) than part-time faculty (64 percent).

Full- and part-time instructional faculty and staff who rated their institution's computing resources either good or excellent were much more likely to use e-mail to communicate with students in their classes compared with those who rated their institution's computing resources as poor (table 6). Moreover, among full-time instructional faculty and staff, the use of e-mail to communicate with students increased from 43 percent to 74 percent as the quality of the institution's computing resources improved from poor to excellent.

Table 5.—Percentage of full- and part-time postsecondary instructional faculty and staff who used e-mail and course-specific Web sites, by access to the Internet: Fall 1998

	Used e-mail to communicate with students		Used course-specific Web site	
	Full-time	Part-time	Full-time	Part-time
Total	69.2	46.3	40.4	34.3
Access to Internet				
Both at home and at work	77.5	63.5	44.8	41.2
At work only	63.6	36.4	34.7	31.9
At home only	36.8	41.6	26.8	26.7
No access to Internet	10.9	6.0	29.0	26.0

NOTE: This table includes only instructional faculty and staff who taught one or more classes for credit.

SOURCE: U.S. Department of Education, National Center for Education Statistics, 1999 National Study of Postsecondary Faculty (NSOPF:99).

Table 6.—Percentage of full- and part-time postsecondary instructional faculty and staff who used e-mail and course-specific Web sites, by institution's quality of computing resources: Fall 1998

	Used e-mail to communicate with students		Used course-specific Web site	
	Full-time	Part-time	Full-time	Part-time
Total	69.2	46.3	40.4	34.3
Quality of computing resources*				
Poor	42.6	39.9	32.8	10.0
Fair	63.6	49.0	37.8	29.3
Good	70.7	50.1	40.5	41.4
Excellent	73.5	53.2	41.3	53.7

*Based on average of respondent's ratings (poor, fair, good, excellent) of the institution's personal computers and local networks, centralized (mainframe) computer facilities, Internet connections, and technical support for computer-related activities.

NOTE: This table includes only instructional faculty and staff who taught one or more classes for credit.

SOURCE: U.S. Department of Education, National Center for Education Statistics, 1999 National Study of Postsecondary Faculty (NSOPF:99).

While the quality of computing resources was not associated with the use of course-specific Web sites among full-time instructional faculty and staff, there was a relationship between part-time instructional faculty's use of course-specific Web sites and the quality of their institution's computing resources. As the quality of the institution's computing resources improved from poor to excellent, part-time faculty's use of course-specific Web sites increased from 10 percent to 54 percent.

Analysis of the Relationship Between Access to and Quality of Computing Resources to Instructional Use, Controlling for Selected Characteristics

The above analysis showed a number of differences in availability, quality, and use of computing resources among postsecondary instructional faculty and staff. It also showed that the relationship of access and quality to instructional use varies considerably among faculty. In general, access to the Internet, faculty's ratings of their institutions' quality of computing resources, and employment status and type of institution were associated with use of e-mail and course-specific Web sites. Because these characteristics are interrelated with each other and other academic and demographic characteristics, the observed relationships may not reflect the independent relationships when the effects of other related factors are controlled.

For example, the finding that instructional faculty and staff at 4-year doctoral institutions were more likely to use e-mail and course-specific Web sites may be confounded by the fact that those who have more access to the Internet were more likely to use telecommunications technologies, and those at 4-year doctoral institutions were more likely to have access both at home and at work. This suggests that the relationship between institution type and use of telecommunications technologies may be reduced if access to the Internet were controlled.

In order to examine the relationship between availability and quality of computing resources to instructional use, a multivariate model was used.[6] This model allows examination of how specific variables are associated with the outcomes of interest while simultaneously controlling for the interrelationships among a group of variables. Two outcomes were examined in the regression analyses: the proportion of instructional faculty and staff who used e-mail to communicate with students in their classes and the proportion of instructional faculty and staff who used course-specific Web sites. The independent variables included access to the Internet, institution's quality of computing resources and instructional faculty's age, gender, race/ethnicity, academic rank, employment status, institution type, level of students taught, principal field of teaching, and tenure status. The results of these analyses are presented in tables 7 (use of e-mail to communicate with students) and 8 (use of course-specific Web sites). Column one shows the percentages of instructional faculty and staff who used e-mail for each independent variable category. Column two shows the corresponding percentages after controlling for the covariation of the independent variables included in the model. Asterisks indicate whether a particular group differs significantly from the comparison group, which is italicized.

[6]See appendix B for details on method used.

Table 7.—Percentage of postsecondary instructional faculty and staff who used e-mail to communicate with students and adjusted percentage after taking into account the covariation of selected demographic and academic characteristics: Fall 1998

Variable[1]	Unadjusted percentage[2]	Adjusted percentage[3]	Least squares coefficient[4]	Standard error[5]
Total	59.4	59.4	97.7	5.7
Access to Internet				
At work only	55.1*	53.2*	-16.4	1.7
At home only	40.7*	50.4*	-19.2	2.5
No access to Internet	7.3*	19.2*	-50.4	3.0
Both at home and at work	*72.4*	*69.6*	†	†
Quality of computing resources				
Fair	57.0*	57.3	-2.4	2.4
Good	63.1*	59.3	-0.4	2.1
Excellent	66.7*	61.3	1.6	2.5
Poor	*40.7*	*59.7*	†	†
Age				
35–44	63.7	63.7	-2.3	2.7
45–54	60.0	59.7*	-6.3	2.7
55–64	56.3*	54.0*	-12.0	2.9
65 or older	44.4*	49.8*	-16.2	3.8
Under 35	*63.8*	*66.0*	†	†
Gender				
Female	55.9*	60.3	1.5	1.6
Male	*61.8*	*58.7*	†	†
Race/ethnicity				
American Indian/Alaska Native	66.3*	67.6*	16.9	8.5
Asian/Pacific Islander	67.8*	57.7	7.0	4.7
Hispanic	59.7*	59.5	9.2	3.3
White, non-Hispanic	59.5*	59.9*	8.8	5.0
Black, non-Hispanic	*47.4*	*50.7*	†	†
Academic rank				
Full professor	66.8	58.8	0.1	3.1
Associate professor	70.8	60.1	1.5	3.0
Instructor/lecturer	48.3*	58.9	0.2	2.8
Other ranks/no ranks	53.2*	61.3	2.6	3.2
Assistant professor	*69.6*	*58.7*	†	†
Employment status				
Part-time	46.3*	54.2*	-9.1	2.2
Full-time	*69.2*	*63.3*	†	†
Institution type				
4-year nondoctoral	63.2*	62.4*	-7.5	1.9
2-year	38.9*	44.2*	-25.6	2.2
4-year doctoral	*73.9*	*69.9*	†	†

See footnotes at end of table.

Table 7.—Percentage of postsecondary instructional faculty and staff who used e-mail to communicate with students and adjusted percentage after taking into account the covariation of selected demographic and academic characteristics: Fall 1998—Continued

Variable[1]	Unadjusted percentage[2]	Adjusted percentage[3]	Least squares coefficient[4]	Standard error[5]
Level of students taught[6]				
Undergraduate only	55.2*	58.8*	-5.2	2.5
Graduate only	66.2*	58.5	-5.5	2.9
Undergraduate and graduate	*78.0*	*64.0*	†	†
Principal field of teaching[7]				
Business	67.0	66.2	-2.5	3.6
Education	64.5*	63.0	-5.7	3.7
Fine arts	45.1*	51.1*	-17.5	3.7
Health sciences	43.5*	39.0*	-29.7	3.4
Human services	48.9*	52.3*	-16.3	4.1
Humanities	60.3*	64.5	-4.2	3.1
Life sciences	65.7	59.5*	-9.2	3.9
Natural/physical sciences and mathematics	62.3*	61.9*	-6.8	3.4
Social sciences	66.2*	64.5	-4.2	3.2
Vocational education	47.7*	55.7*	-13.0	4.4
Engineering and computer sciences	*75.5*	*68.7*	†	†
Tenure status				
Tenured	69.2*	61.6	-0.4	3.1
No tenure[8]	50.7*	57.5	-4.5	3.0
On tenure track	*73.7*	*62.0*	†	†

*$p \leq .05$.

†Not applicable for the reference group.

[1]The italicized group in each category is the reference group being compared.

[2]The estimates are from the NSOPF:99 Data Analysis System.

[3]The percentages are adjusted for differences associated with other variables in the table (see appendix B).

[4]Least squares coefficient, multiplied by 100 to reflect percentage (see appendix B).

[5]Standard error of least squares coefficient, adjusted for design effect, multiplied by 100 to reflect percentage (see appendix B).

[6]Based on reports of the primary level of students taught in up to five for-credit classes.

[7]Included in the total but not shown separately are those who did not specify a principal field of teaching.

[8]This group includes those not on tenure track or those at institutions with no tenure system.

NOTE: This table includes only instructional faculty and staff who taught one or more classes for credit. The multiple R^2 for the model shown in this table is 0.242.

SOURCE: U.S. Department of Education, National Center for Education Statistics, 1999 National Study of Postsecondary Faculty (NSOPF:99).

Table 8.—Percentage of postsecondary instructional faculty and staff who used course-specific Web sites and the adjusted percentage after taking into account the covariation of selected demographic and academic characteristics: Fall 1998

Variable[1]	Unadjusted percentage[2]	Adjusted percentage[3]	Least squares coefficient[4]	Standard error[5]
Total	37.7	37.7	69.7	6.7
Access to Internet				
At work only	33.8*	33.4*	-8.7	2.1
At home only	26.7*	31.5*	-10.6	2.9
No access to Internet	26.8*	31.2*	-10.9	3.6
Both at home and at work	*43.5*	*42.1*	†	†
Quality of computing resources				
Fair	33.9*	33.6	3.2	2.9
Good	40.8*	38.7*	8.2	2.5
Excellent	45.4*	45.9*	15.4	2.9
Poor	*16.5*	*30.5*	†	†
Age				
35–44	41.1	40.9	-0.5	3.2
45–54	37.3	37.4	-4.0	3.2
55–64	35.0	34.2*	-7.2	3.4
65 or older	33.8	34.4	-7.0	4.4
Under 35	*40.1*	*41.4*	†	†
Gender				
Female	34.0*	35.9	-3.1	1.9
Male	*40.4*	*39.0*	†	†
Race/ethnicity				
American Indian/Alaska Native	36.8	39.3	-7.8	10.0
Asian/Pacific Islander	42.9	38.5	-8.6	5.6
Hispanic	44.5	44.6	-10.2	3.9
White, non-Hispanic	36.8*	36.9*	-2.5	5.9
Black, non-Hispanic	*45.1*	*47.1*	†	†
Academic rank				
Full professor	42.6	43.2	3.5	3.7
Associate professor	41.1	39.8	0.1	3.6
Instructor/lecturer	36.5*	36.9	-2.9	3.3
Other ranks/no ranks	25.0*	26.8*	-13.0	3.8
Assistant professor	*42.1*	*39.8*	†	†
Employment status				
Part-time	34.3*	38.6	1.6	2.5
Full-time	*40.4*	*37.1*	†	†

See footnotes at end of table.

Table 8.—Percentage of postsecondary instructional faculty and staff who used course-specific Web sites and the adjusted percentage after taking into account the covariation of selected demographic and academic characteristics: Fall 1998—Continued

Variable[1]	Unadjusted percentage[2]	Adjusted percentage[3]	Least squares coefficient[4]	Standard error[5]
Institution type				
4-year nondoctoral	36.4*	36.4*	-5.0	2.2
2-year	33.2*	35.4*	-5.9	2.6
4-year doctoral	*43.4*	*41.3*	†	†
Level of students taught[6]				
Undergraduate only	36.2*	37.4*	-6.9	3.0
Graduate only	36.6*	34.6*	-9.7	3.5
Undergraduate and graduate	*49.1*	*44.3*	†	†
Principal field of teaching[7]				
Business	43.3	43.4	-3.3	4.3
Education	35.9*	36.9*	-9.8	4.4
Fine arts	36.4*	38.0*	-8.7	4.4
Health sciences	33.4*	32.3*	-14.4	4.0
Human services	29.8*	32.0*	-14.7	4.9
Humanities	36.2*	38.0*	-8.7	3.7
Life sciences	36.1*	33.6*	-13.1	4.7
Natural/physical sciences and mathematics	37.8*	36.8*	-9.9	4.1
Social sciences	35.6*	35.1*	-11.7	3.7
Vocational education	48.0	49.4	2.7	5.2
Engineering and computer sciences	*51.3*	*46.7*	†	†
Tenure status				
Tenured	40.6	36.3	-1.6	3.7
No tenure[8]	35.2*	38.6	0.8	3.5
On tenure track	*42.5*	*37.8*	†	†

*$p \leq .05$.

†Not applicable for the reference group.

[1]The italicized group in each category is the reference group being compared.

[2]The estimates are from the NSOPF:99 Data Analysis System.

[3]The percentages are adjusted for differences associated with other variables in the table (see appendix B).

[4]Least squares coefficient, multiplied by 100 to reflect percentage (see appendix B).

[5]Standard error of least squares coefficient, adjusted for design effect, multiplied by 100 to reflect percentage (see appendix B).

[6]Based on reports of the primary level of students taught in up to five for-credit classes.

[7]Included in the total but not shown separately are those who did not specify a principal field of teaching.

[8]This group includes those not on tenure track or those at institutions with no tenure system.

NOTE: This table includes only instructional faculty and staff who taught one or more classes for credit. The multiple R^2 for the model shown in this table is 0.062.

SOURCE: U.S. Department of Education, National Center for Education Statistics, 1999 National Study of Postsecondary Faculty (NSOPF:99).

When taking into consideration the quality of computing resources, Internet access, and other academic and demographic characteristics, these variables accounted for 24 percent of the variance in faculty use of e-mail and 6 percent of the variance in faculty use of course-specific Web sites.[7] Two key relationships identified in the tabular analysis remained after controlling for various characteristics. Specifically, when controlling for quality of computing resources and other academic and demographic characteristics, postsecondary instructional faculty and staff who had access to the Internet both at home and at work were significantly more likely to use e-mail and course-specific Web sites than those who had access only at home or at work, or no access. In both cases, bivariate correlations show that Internet access was the most important factor in accounting for the variance in e-mail and Web site use; having Internet access both at work and at home had a correlation of .290 with e-mail use, a moderate-sized relationship, and a correlation of .130 with the use of Web sites for courses, a small-sized relationship. Postsecondary instructional faculty and staff at 4-year doctoral institutions were also more likely to use e-mail and course-specific Web sites than those at 4-year nondoctoral or 2-year institutions when availability and quality of resources and other academic and demographic characteristics were taken into account.

As suggested in tabular analysis, instructional faculty's principal field of teaching was also related to use of telecommunications technologies. With exception of four teaching fields (business, education, humanities, and social sciences), instructional faculty and staff who taught in the field of engineering and computer sciences were more likely to use e-mail than those who taught in other disciplines. Faculty who taught in engineering and computer sciences were also more likely than those who taught in other disciplines (except for business and vocational education) to use course-specific Web sites. After controlling for other variables, the quality of computing resources also remained a significant factor in the likelihood of using course-specific Web sites: overall, instructional faculty and staff who rated their institution's computing resources as good or excellent were more likely to use course-specific Web sites than were those who rated the computing resources as poor. The likelihood of using e-mail and course-specific Web sites was higher for instructional faculty and staff who taught both undergraduate and graduate students compared with those who taught only undergraduates. Age remained a significant factor after controlling for other variables. Faculty who were under 35 years old were more likely to use e-mail to communicate with their students than all other age groups except those who were 35–44 years old.

[7]Bivariate correlations showed that the effect sizes of the independent variables on use of e-mail were small to moderate, with correlations ranging in absolute value from .001 to .295. The correlations of the independent variables to use of Web sites all represented small effect sizes, ranging in absolute value from .001 to .130. See appendix B for details.

There are three noteworthy exceptions to the relationship after controlling for various characteristics. The first exception is the relationship between employment status and use of course-specific Web sites. After controlling for related characteristics, the adjusted percentages indicated that full-time faculty (63 percent) remained more likely than part-time faculty (54 percent) to use e-mail (table 7). However, although the unadjusted percentages indicated that full- time faculty (40 percent) were more likely than part-time faculty (34 percent) to use course- specific Web sites, these percentages were no longer found to be statistically different after other variables were taken into consideration (table 8). This suggests that employment status may not be a uniquely critical factor in differentiating who is likely to use course-specific Web sites.

The second exception is the relationship between quality of computing resources and use of e-mail. After controlling for related variables, the quality of computing resources no longer appeared to be a significant factor in the likelihood of using e-mail (table 7). However, the quality of computing resources remained a significant factor in the likelihood of using course-specific Web sites: instructional faculty and staff who rated their institution's computing resources as good or excellent were more likely to use course-specific Web sites than those who rated the computing resources as poor. These findings may reflect the additional technical knowledge required for maintaining Web sites and the relative (and immediate) ease-of-use of e-mail versus course-specific Web sites for most instructional faculty and staff.

The third exception is the relationship between race/ethnicity and use of e-mail and course-specific Web sites. Differences in race/ethnicity all but disappeared as well. Instead of across the board differences, after adjusting for covariance, Black, non-Hispanic faculty were less likely to use e-mail than only White, non-Hispanic and American Indian/Alaska Native faculty. Black, non-Hispanic faculty remained more likely to use course-specific Web sites (47 percent) than White, non-Hispanic faculty (37 percent) (table 8).

Teaching and Technology Use

Although the percentage of faculty who use e-mail and course-specific Web sites provides an important measure of the scope of faculty use of telecommunications technologies, it tells us little about the amount or quality of instruction they provide. To understand issues of how much and in what ways instructional faculty and staff use telecommunications technologies, this section examines the volume of e-mail communication, purposes of course-specific Web sites, and the relationship of volume and purposes of technology use in instruction to the teaching loads of instructional faculty and staff. Again, five key indicators of teaching load are examined: average number of hours worked per week; average percentage of time spent on teaching, research, administration, and other/service activities; total number of hours per week teaching students in the classroom; total student contact hours inside the classroom; and average office hours per week.

Volume of E-Mail Communication

With widespread access to the Internet and use of e-mail, it seems logical that e-mail would be used widely by instructional faculty and their students to communicate about their classes. As shown in table 9, this is not the case. Full- and part-time instructional faculty and staff who used e-mail to communicate with students in their classes reported that about one-third (32–33 percent) of their students communicated with faculty. Both full- and part-time instructional faculty and staff reported spending an average of 2.7 hours per week responding to students' e-mail communications. Overall, the age, race/ethnicity, academic rank and tenure status of full- and part-time instructional faculty and staff were not associated with differences in the average percentage of students that used e-mail or in the average number of hours per week spent responding to students' e-mail communications. One exception is that full-time faculty who were 55–64 years old spent slightly more time per week responding to students' e-mail (3 hours) than those who were under 35 years old (2 hours). On average, full-time female faculty had a higher percentage of students who used e-mail for communication (35 percent) than full-time male faculty (32 percent), and both full- and part-time female faculty spent more time per week responding to students' e-mail communications (3.1 hours per week for each group) than their full-time (2.5 hours per week) and part-time male counterparts (2.3 hours per week).

Table 9.—Among full- and part-time postsecondary instructional faculty and staff who used e-mail to communicate with students, percentage of students using e-mail for course-specific communication and the average hours per week faculty spent responding to students' e-mail, by selected demographic and academic characteristics: Fall 1998

	Percent of students who used e-mail for course-specific communication		Hours per week spent responding to students' e-mail communications	
	Full-time	Part-time	Full-time	Part-time
Total	32.9	32.1	2.7	2.7
Age				
Under 35	36.1	35.1	2.2	2.3
35–44	33.4	30.9	2.6	2.9
45–54	32.6	29.1	2.6	2.7
55–64	31.5	32.0	3.0	2.4
65 or older	33.4	45.3	3.5	3.4
Gender				
Male	32.0	32.8	2.5	2.3
Female	34.6	31.4	3.1	3.1
Race/ethnicity				
American Indian/Alaska Native	22.5	(#)	2.9	(#)
Asian/Pacific Islander	33.2	31.2	2.5	2.7
Black, non-Hispanic	32.8	27.6	3.2	3.2
Hispanic	30.9	35.4	3.2	2.4
White, non-Hispanic	33.0	32.1	2.7	2.6
Academic rank				
Full professor	33.9	38.2	2.9	2.9
Associate professor	32.0	26.5	2.6	2.6
Assistant professor	32.9	32.4	2.6	2.5
Instructor/lecturer	31.3	31.5	2.8	2.7
Other ranks/not applicable	34.5	33.2	2.7	2.6
Institution type				
4-year doctoral	39.0	40.0	2.6	2.4
4-year nondoctoral	29.3	33.9	2.8	2.7
2-year	22.3	22.5	2.8	2.9
Level of students taught[1]				
Undergraduate only	28.9	28.7	2.7	2.8
Undergraduate and graduate	35.9	43.0	2.9	2.1
Graduate only	44.0	45.6	2.8	2.1

See footnotes at end of table.

Table 9.—Among full- and part-time postsecondary instructional faculty and staff who used e-mail to communicate with students, percentage of students using e-mail for course-specific communication and the average hours per week faculty spent responding to students' e-mail, by selected demographic and academic characteristics: Fall 1998—Continued

	Percent of students who used e-mail for course-specific communication		Hours per week spent responding to students' e-mail communications	
	Full-time	Part-time	Full-time	Part-time
Principal field of teaching[2]				
Business	34.5	41.3	3.0	2.8
Education	45.9	36.7	3.3	2.7
Engineering and computer sciences	44.0	46.2	2.9	2.4
Fine arts	25.1	33.3	2.4	3.2
Health sciences	33.9	35.2	2.7	3.0
Human services	32.4	27.5	3.4	2.2
Humanities	29.5	27.5	2.9	2.6
Life sciences	31.2	27.2	2.3	2.5
Natural/physical sciences and mathematics	27.5	21.8	2.3	2.8
Social sciences	29.2	26.4	2.6	2.5
Vocational fields	25.2	34.2	2.9	2.8
Tenure status				
Tenured	32.8	31.6	2.7	3.1
On tenure track	32.2	(#)	2.8	(#)
No tenure[3]	33.6	32.1	2.7	2.7

#Too small to report.

[1]Based on reports of the primary level of students taught in up to five for-credit classes.

[2]Included in the total but not shown separately are those who did not specify a principal field of teaching.

[3]This group includes those not on tenure track or those at institutions with no tenure system.

NOTE: This table includes only instructional faculty and staff who taught one or more classes for credit and who also used e-mail to communicate with students in their classes.

SOURCE: U.S. Department of Education, National Center for Education Statistics, 1999 National Study of Postsecondary Faculty (NSOPF:99).

Once again, institution type, level of students taught, and principal field of teaching were related to the use of technologies among postsecondary instructional faculty and their students. Among full-time instructional faculty and staff who used e-mail to communicate with students in their classes in fall 1998, those at 4-year doctoral institutions reported a higher proportion of their students who e-mailed them (39 percent) than their counterparts at 4-year nondoctoral (29 percent) and 2-year institutions (22 percent). Similarly, among part-time instructional faculty and staff who used e-mail, those at 2-year institutions reported a lower average percentage of students (23 percent) who e-mailed them compared with those faculty and staff at 4-year doctoral (40 percent) and nondoctoral institutions (34 percent). However, no differences by institution type were

detected for either full- or part-time faculty in the number of hours per week spent responding to students' e-mail.

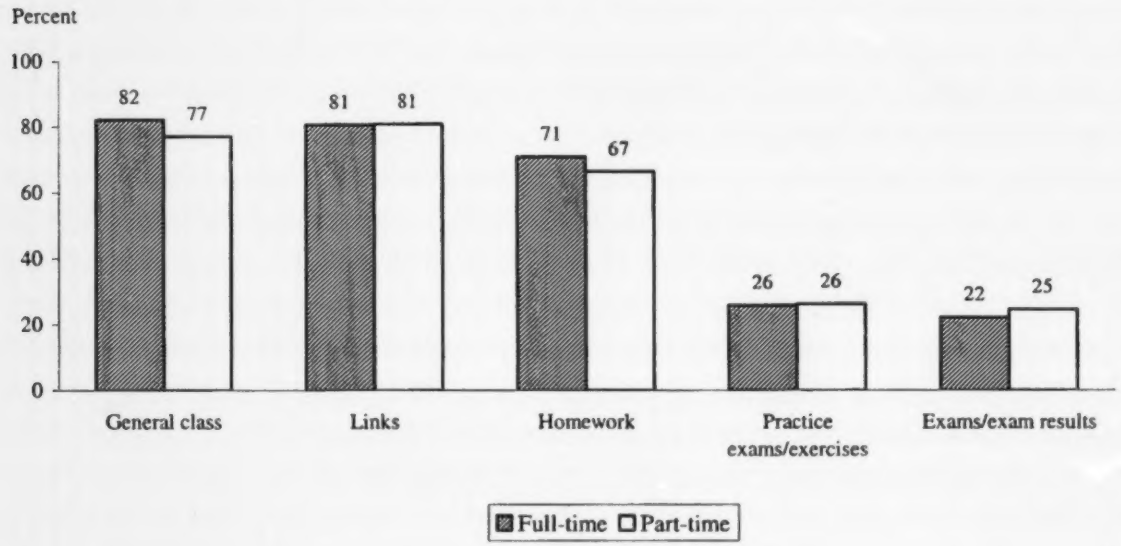
Full-time and part-time instructional faculty and staff who taught only graduate students reported a higher percentage of students who e-mailed them than those who taught only undergraduates (44 percent of full-time and 46 percent of part-time faculty teaching only graduate compared to 29 percent for those teaching only undergraduates). Conversely, part-time instructional faculty and staff who taught only undergraduate students spent more time per week responding to students' e-mail (2.8 hours per week) compared with those who taught both undergraduate and graduate students (2.1 hours per week).

On average, the percentage of students who used e-mail for communication with faculty was greater for those full-time instructional faculty and staff in the teaching fields of education (46 percent) and engineering and computer sciences (44 percent) compared with those faculty and staff in all other teaching fields (25 to 35 percent). Those full-time faculty in the field of education also spent a higher average number of hours per week responding to students' e-mail communications (3.3 hours) than either those in the natural/physical sciences, and mathematics, or in the life sciences (2.3 hours for each). There was also an association between teaching field and the percentage of students who used e-mail for communicating among part-time faculty. The percentage of students who used e-mail for communication with faculty was greater for those part-time instructional faculty and staff in the teaching fields of engineering and computer sciences (46 percent) compared with that of faculty in human services (28 percent), in humanities (28 percent), in life sciences (27 percent), in natural/physical sciences and mathematics (22 percent), and in the social sciences (26 percent). Differences in average number of hours per week responding to students' e-mail communications were not found for part-time instructional faculty and staff.

Purpose of Course-Specific Web Sites

Full- and part-time faculty and staff used course-specific Web sites for various teaching purposes (figure 5). Roughly 80 percent of both full- and part-time instructional faculty and staff used course-specific Web sites for the purpose of posting general class information and links to other information, more so than for any other purpose. Full- and part-time instructional faculty and staff were also more likely to use course-specific Web sites for the purpose of posting homework information (two-thirds or more did so) compared with posting practice exams and exercises (26 percent for each group) or exams/exam results (22 and 25 percent, respectively).

Figure 5.—Among postsecondary instructional faculty and staff who used course-specific Web sites, percentage using Web sites for various teaching purposes, by employment status: Fall 1998



NOTE: This figure includes only instructional faculty and staff who taught one or more classes for credit and who also used course-specific Web sites.

SOURCE: U.S. Department of Education, National Center for Education Statistics, 1999 National Study of Postsecondary Faculty (NSOPF:99).

There were a few differences in the likelihood of using course-specific Web sites by academic and demographic variables (tables 10 and 11). Once again, there was an association with institution type. Among both full- and part-time instructional faculty and staff, a larger proportion of those at 4-year doctoral institutions used course-specific Web sites for the purpose of posting general class information (about 85 percent) compared with faculty at 2-year institutions (75 percent for each group). However, differences were not found between full-time faculty at 4-year doctoral institutions and those at 4-year nondoctoral or 2-year institutions in their use of Web sites for posting homework, practice exams/exercises, exams/exam results, or links to other information (table 10). Part-time instructional faculty and staff at 4-year doctoral institutions were less likely (19 percent) than faculty at 2-year institutions (33 percent) to use Web sites for the purpose of posting practice exams or exercises (table 11). Part-time faculty at 4-year doctoral institutions were also less likely (15 percent) than their counterparts at 4-year nondoctoral (27 percent) and 2-year institutions (29 percent) to use Web sites for the purpose of posting exams/exam results.

Table 10.—Among full-time postsecondary instructional faculty and staff who used course-specific Web sites, percentage using Web sites for specific teaching purposes, by selected demographic and academic characteristics: Fall 1998

	Purpose of course-specific Web site is to post information on:				
	General class	Homework	Practice exams and exercises	Exams/ exam results	Links
Total	82.2	70.9	25.8	22.2	80.6
Age					
Under 35	88.5	79.6	20.7	22.4	78.6
35–44	84.1	71.4	28.1	23.9	84.7
45–54	82.9	70.7	24.6	22.7	81.0
55–64	79.9	69.6	28.4	19.1	76.0
65 or older	68.8	63.2	19.4	23.9	80.3
Gender					
Male	83.8	71.9	26.1	22.5	79.9
Female	78.8	69.0	25.2	21.8	82.2
Race/ethnicity					
American Indian/Alaska Native	(#)	(#)	(#)	(#)	(#)
Asian/Pacific Islander	87.6	72.1	29.9	26.2	82.4
Black, non-Hispanic	81.3	73.4	28.5	23.4	78.7
Hispanic	78.6	65.2	28.3	25.3	81.2
White, non-Hispanic	82.0	71.0	25.2	21.7	80.5
Academic rank					
Full professor	82.8	72.3	27.3	20.4	78.4
Associate professor	83.3	72.4	28.3	25.4	80.8
Assistant professor	84.3	70.5	22.2	22.0	81.7
Instructor/lecturer	76.5	68.1	26.1	21.5	81.6
Other ranks/not applicable	80.0	66.1	20.5	21.5	86.0
Institution type					
4-year doctoral	85.3	72.3	25.0	22.6	80.0
4-year nondoctoral	81.5	71.2	25.6	21.1	81.1
2-year	75.0	66.5	28.5	23.5	81.4
Level of students taught[1]					
Undergraduate only	80.3	70.7	27.1	24.7	80.1
Undergraduate and graduate	85.8	73.6	22.5	18.7	82.8
Graduate only	84.8	68.4	24.9	16.8	80.0

See footnotes at end of table.

Table 10.—Among full-time postsecondary instructional faculty and staff who used course-specific Web sites, percentage using Web sites for specific teaching purposes, by selected demographic and academic characteristics: Fall 1998—Continued

	Purpose of course-specific Web site is to post information on:				
	General class	Homework	Practice exams and exercises	Exams/ exam results	Links
Principal field of teaching[2]					
Business	84.5	76.2	27.3	21.0	79.3
Education	84.9	74.7	17.6	18.8	91.9
Engineering and computer sciences	87.0	78.6	29.2	28.6	81.9
Fine arts	81.7	61.7	18.2	24.6	79.2
Health sciences	78.1	61.1	29.1	17.3	77.6
Human services	76.6	71.4	17.9	21.0	87.2
Humanities	80.9	71.5	26.2	18.6	78.6
Life sciences	82.6	62.9	26.6	21.6	80.7
Natural/physical sciences and mathematics	84.7	74.9	27.3	28.0	79.8
Social sciences	85.6	76.3	29.7	21.4	75.4
Vocational fields	58.7	53.4	21.2	26.3	89.4
Tenure status					
Tenured	82.5	71.7	27.3	22.3	79.6
On tenure track	84.9	74.7	24.4	24.7	82.3
No tenure[3]	79.3	66.2	23.8	20.2	81.6

#Too small to report.

[1]Based on reports of the primary level of students taught in up to five for-credit classes.

[2]Included in the total but not shown separately are those who did not specify a principal field of teaching.

[3]This group includes those not on tenure track or those at institutions with no tenure system.

NOTE: This table includes only full-time instructional faculty and staff who taught one or more classes for credit and who also used course-specific Web sites.

SOURCE: U.S. Department of Education, National Center for Education Statistics, 1999 National Study of Postsecondary Faculty (NSOPF:99).

The level of students taught and principal field of teaching also showed differences among instructional faculty and staff who used course-specific Web sites for specific purposes. Full-time instructional faculty and staff who only taught undergraduate students were more likely to use course-specific Web sites to post exams or exam results (25 percent) than those faculty who taught either graduate students only (17 percent) or both undergraduate and graduate students (19 percent) (table 10).

In terms of teaching field, a lower proportion of full-time faculty and staff who taught in vocational education (59 percent) used course-specific Web sites for the purpose of posting general class information compared with faculty in the teaching fields of business (85 percent), education (85 percent), engineering/computer sciences (87 percent), natural, physical sciences, and

Table 11.—Among part-time postsecondary instructional faculty and staff who used course-specific Web sites, percentage using Web sites for specific teaching purposes, by selected demographic and academic characteristics: Fall 1998

	Purpose of course-specific Web site is to post information on:				
	General class	Homework	Practice exams and exercises	Exams/ exam results	Links
Total	77.1	66.5	26.3	24.6	80.9
Age					
Under 35	82.4	72.5	25.8	20.5	85.3
35–44	71.9	58.7	26.1	27.5	81.6
45–54	82.4	69.8	25.5	22.2	75.2
55–64	70.2	64.6	33.6	27.5	86.1
65 or older	77.0	71.9	14.7	25.9	85.0
Gender					
Male	79.1	66.5	28.9	27.9	81.3
Female	74.7	66.4	23.0	20.5	80.4
Race/ethnicity					
American Indian/Alaska Native	(#)	(#)	(#)	(#)	(#)
Asian/Pacific Islander	45.6	36.1	18.1	44.3	83.2
Black, non-Hispanic	73.0	62.2	16.1	14.1	83.7
Hispanic	83.5	74.7	23.7	10.3	90.3
White, non-Hispanic	77.8	67.4	27.1	25.4	80.3
Academic rank					
Full professor	77.0	62.7	31.7	33.1	68.8
Associate professor	70.3	67.9	44.9	32.4	77.3
Assistant professor	77.8	70.6	21.0	15.2	91.0
Instructor/lecturer	78.0	67.5	24.0	25.1	82.2
Other ranks/not applicable	74.9	62.8	28.7	16.9	81.5
Institution type					
4-year doctoral	84.3	71.3	18.7	14.6	83.0
4-year nondoctoral	75.0	66.8	23.8	26.5	80.7
2-year	74.9	63.5	32.7	28.6	79.9
Level of students taught[1]					
Undergraduate only	76.4	65.7	27.2	25.7	80.5
Undergraduate and graduate	84.7	80.4	23.2	23.3	77.1
Graduate only	78.1	63.8	21.4	17.4	85.9

See footnotes at end of table.

Table 11.—Among part-time postsecondary instructional faculty and staff who used course-specific Web sites, percentage using Web sites for specific teaching purposes, by selected demographic and academic characteristics: Fall 1998—Continued

	Purpose of course-specific Web site is to post information on:				
	General class	Homework	Practice exams and exercises	Exams/ exam results	Links
Principal field of teaching[2]					
Business	81.6	73.0	27.4	23.2	79.9
Education	77.9	76.1	26.1	31.3	80.3
Engineering and computer sciences	79.1	66.8	34.9	28.6	84.2
Fine arts	69.2	55.8	17.0	22.6	79.4
Health sciences	78.0	66.2	24.1	20.5	82.9
Human services	85.1	67.2	22.0	25.4	79.9
Humanities	75.1	68.4	29.0	22.7	85.3
Life sciences	(#)	(#)	(#)	(#)	(#)
Natural/physical sciences and mathematics	73.6	64.3	28.8	18.1	75.0
Social sciences	77.7	63.8	29.4	30.6	73.1
Vocational fields	77.5	66.3	16.5	25.9	90.3
Tenure status					
Tenured	82.2	70.5	22.6	18.8	72.0
On tenure track	(#)	(#)	(#)	(#)	(#)
No tenure[3]	76.8	66.3	26.4	24.9	81.0

#Too small to report.

[1]Based on reports of the primary level of students taught in up to five for-credit classes.

[2]Included in the total but not shown separately are those who did not specify a principal field of teaching.

[3]This group includes those not on tenure track or those at institutions with no tenure system.

NOTE: This table includes only part-time instructional faculty and staff who taught one or more classes for credit and who also used course-specific web-sites.

SOURCE: U.S. Department of Education, National Center for Education Statistics, 1999 National Study of Postsecondary Faculty (NSOPF:99).

mathematics (85 percent), and the social sciences (86 percent). In addition, a larger proportion of faculty in the teaching field of education (92 percent) used course-specific Web sites for the purpose of posting links to other information, compared with the fields of health sciences (78 percent), humanities (79 percent), natural, physical sciences, and mathematics (80 percent), and social sciences (75 percent).

Workload

Many proponents of information technology, such as e-mail and course-specific Web sites, tout its efficiency, flexibility, and promise for increasing teaching and learning productivity (Massy and Zemsky 1995). Though NSOPF:99 does not ask faculty respondents specifically

about issues of productivity and technology use, it is possible to assess the relationship between technology use and faculty workload more generally.

As shown in table 12, in fall 1998, full-time instructional faculty and staff who taught for-credit courses at degree-granting postsecondary institutions worked an average of 53 hours per week. Full-time instructional faculty and staff at 4-year doctoral institutions were more likely to work longer hours per week (56 hours) compared with those at 4-year nondoctoral (53 hours) and 2-year institutions (49 hours).

In general, full-time instructional faculty and staff who used e-mail or course-specific Web sites worked more hours per week on average (55 hours) compared with those who did not use either e-mail (50 hours) or course-specific Web sites (52 hours). At 4-year doctoral institutions, full-time instructional faculty and staff who used e-mail worked more hours per week on average (56 hours) compared with those who did not use e-mail (54 hours). However, there was no difference between faculty who used course-specific Web sites (56 hours) and those who did not (55 hours). At both 4-year nondoctoral and 2-year institutions, full-time instructional faculty and staff who used e-mail or course-specific Web sites worked more hours per week on average than those who did not use either e-mail or course-specific Web sites. The finding that full-time faculty who used e-mail worked longer may be due to the additional demands placed on their time by making themselves available to students via e-mail. Alternatively, workload may not be directly related to e-mail use. For example, faculty who used e-mail were more likely to be assistant professors and on the tenure track, and these faculty typically work longer hours than average.

Full-time instructional faculty and staff spent an average of 60 percent of their time on teaching activities, 14 percent on research activities, 13 percent on administrative activities, and 13 percent on other activities. Compared with those at 4-year nondoctoral and 2-year institutions, full-time instructional faculty and staff at 4-year doctoral institutions spent less of their time on teaching activities but more on research activities.

Overall, full-time instructional faculty and staff who did not use e-mail and course-specific Web sites reported spending a larger percentage of their time on teaching activities. Those who did use e-mail and Web sites spent more of their time on research activities. On average, full-time instructional faculty and staff who did not use e-mail spent 63 percent of their time on teaching activities compared with 59 percent spent by those who used e-mail. In contrast, full-time instructional faculty and staff who used e-mail spent more of their time on research activities (15 percent) than those who did not do so (10 percent). A similar pattern was observed for

Table 12.—Among full-time postsecondary instructional faculty and staff who taught classes for credit, average number of hours worked per week, and percentage distribution of time spent on professional activities, by use of e-mail and course-specific Web sites and institution type: Fall 1998

	Average number of hours worked per week*	Average percentage of time spent on the following activities:			
		Teaching	Research	Administration	Other
Total	53.2	60.1	13.6	13.2	13.1
Used e-mail					
Yes	54.5	58.7	15.3	13.8	12.3
No	50.3	63.2	9.9	11.9	15.0
Used Web site					
Yes	54.9	58.7	15.4	12.6	13.3
No	52.1	61.0	12.4	13.6	13.0
4-year doctoral	55.5	50.5	22.5	13.1	13.9
Used e-mail					
Yes	55.9	51.3	23.2	13.2	12.3
No	54.1	47.8	20.0	12.8	19.5
Used Web site					
Yes	56.1	51.0	23.4	12.2	13.5
No	54.9	50.1	21.7	13.9	14.3
4-year nondoctoral	52.9	64.0	9.1	14.4	12.5
Used e-mail					
Yes	53.8	63.3	9.7	15.1	12.0
No	50.5	65.8	7.8	12.8	13.6
Used Web site					
Yes	54.6	63.3	10.0	13.9	12.9
No	51.8	64.5	8.6	14.8	12.2
2-year	49.1	72.5	3.7	11.1	12.7
Used e-mail					
Yes	51.7	70.8	4.3	12.0	13.0
No	46.6	74.2	3.1	10.3	12.4
Used Web site					
Yes	52.0	70.1	4.9	11.2	13.8
No	47.6	73.8	3.0	11.1	12.1

*Average number of hours worked per week includes the sum of all paid activities at institution (e.g., teaching, clinical service, class preparation, research, administration), all unpaid activities at institution, any other paid activities outside of institution (e.g., consulting), and unpaid professional service activities outside this institution.

NOTE: This table includes only full-time instructional faculty and staff who taught one or more classes for credit. Details may not sum to 100 due to rounding.

SOURCE: U.S. Department of Education, National Center for Education Statistics, 1999 National Study of Postsecondary Faculty (NSOPF:99).

full-time faculty who did and did not use course-specific Web sites: those who did not use course-specific Web sites spent more of their time on teaching activities (61 percent) compared with those who used Web sites (59 percent). On the other hand, full-time instructional faculty and staff who used course-specific Web sites spent more of their time on research activities (15 percent) than those who did not do so (12 percent).

The relationship between average percentage of time spent on teaching and research activities for those who did and did not use e-mail differed somewhat for those at 4-year doctoral institutions. Compared with those who did not use e-mail, full-time instructional faculty and staff at 4-year doctoral institutions who did so spent more of their time on both teaching activities (51 versus 48 percent, respectively) and research activities (23 versus 20 percent, respectively). Those who used e-mail and course-specific Web sites at 2-year institutions spent less of their time on teaching activities but more of their time on research activities than those who did not do so. Additionally, full-time instructional faculty and staff at 4-year nondoctoral institutions who used e-mail and course-specific Web sites spent a larger percentage of their time on research activities than those who did not do so.

As shown in table 13, in fall 1998, part-time instructional faculty and staff who taught for-credit courses at degree-granting postsecondary institutions worked an average of 37 hours per week. Like their full-time counterparts, part-time instructional faculty and staff who used e-mail or course-specific Web sites worked more hours per week on average (39 hours and 43 hours) compared with those who did not use either e-mail (36 hours) or course-specific Web sites (34 hours). The relationship between hours worked per week and use of e-mail and course-specific Web sites was also found for those at 4-year doctoral institutions. Those part-time instructional faculty and staff at 4-year doctoral institutions who used e-mail or course-specific Web sites worked more hours per week on average (40 and 42 hours) compared with those who did not use either e-mail or course-specific Web sites (36 hours each). However, at 4-year nondoctoral and 2-year institutions, although part-time instructional faculty who used course-specific Web sites worked more hours per week on average compared with those who did not use course-specific Web sites, no difference was detected in work hours between those who used e-mail and those who did not use it.

Part-time instructional faculty and staff spent an average of 63 percent of their time on teaching activities, 5 percent on research activities, 3 percent on administrative activities, and 29 percent on other activities. Compared with those at 4-year nondoctoral and 2-year institutions, part-time instructional faculty and staff at 4-year doctoral institutions spent less of their time on teaching activities but more of it on research activities. Like their full-time counterparts, part-

Table 13.—Among part-time postsecondary instructional faculty and staff who taught classes for credit, average number of hours worked per week, and percentage distribution of time spent on professional activities, by use of e-mail and course-specific Web sites and institution type: Fall 1998

	Average number of hours worked per week*	Average percentage of time spent on the following activities:			
		Teaching	Research	Administration	Other
Total	37.0	62.9	4.7	3.4	29.1
Used e-mail					
Yes	38.8	62.3	5.8	3.5	28.5
No	35.5	63.4	3.8	3.3	29.6
Used Web site					
Yes	43.3	54.2	5.8	3.7	36.4
No	33.7	67.4	4.2	3.2	25.3
4-year doctoral	38.5	56.6	7.9	3.8	31.7
Used e-mail					
Yes	40.1	57.9	8.7	3.5	29.9
No	35.9	54.4	6.6	4.4	34.7
Used Web site					
Yes	42.1	49.5	8.2	4.4	37.9
No	36.2	61.1	7.8	3.4	27.7
4-year nondoctoral	37.6	62.2	4.9	3.4	29.5
Used e-mail					
Yes	38.7	63.1	5.6	3.4	27.9
No	36.2	61.1	4.2	3.5	31.3
Used Web site					
Yes	43.0	56.2	5.8	3.3	34.8
No	34.8	65.2	4.5	3.5	26.9
2-year	35.8	66.5	3.0	3.1	27.5
Used e-mail					
Yes	37.7	65.3	3.4	3.6	27.8
No	34.9	67.1	2.8	2.8	27.3
Used Web site					
Yes	44.2	55.2	4.3	3.6	37.0
No	31.7	72.0	2.3	2.8	22.9

*Average number of hours worked per week includes the sum of all paid activities at institution (e.g., teaching, clinical service, class preparation, research, administration), all unpaid activities at institution, any other paid activities outside of institution (e.g., consulting), and unpaid professional service activities outside this institution.

NOTE: This table includes only part-time instructional faculty and staff who taught one or more classes for credit. Details may not sum to 100 due to rounding.

SOURCE: U.S. Department of Education, National Center for Education Statistics, 1999 National Study of Postsecondary Faculty (NSOPF:99).

time instructional faculty and staff who used e-mail and course-specific Web sites spent more of their time on research activities (6 percent) compared with those who did not do so (4 percent). And again, part-time faculty and staff who did not use course-specific Web sites spent a larger percentage of their time on teaching activities (67 percent) compared with those who used Web sites (54 percent). The relationship between average percentage of time part-time instructional faculty and staff spent on research activities and use of e-mail disappeared when taking into account type of institution. However, in each type of institution examined, part-time faculty who used course-specific Web sites spent less of their time on teaching activities than those who did not do so.

Finally, table 14 shows the total number of hours per week faculty taught students in the classroom, and the average contact with students inside and outside of the classroom. Overall, full-time instructional faculty and staff spent about 11 hours per week teaching students in the classroom. Full-time faculty who used either e-mail to communicate with their students or course-specific Web sites reported spending slightly fewer hours teaching classes than those who did not use these telecommunications technologies. Part-time instructional faculty and staff spent about 7 hours per week teaching students in classes. Although part-time faculty who used e-mail reported slightly fewer hours of teaching classes than those who did not use e-mail, no difference was found in hours of teaching between course-specific Web site users and non-users.

The average number of student classroom contact hours per week by full-time instructional faculty and staff in degree-granting institutions was 321 hours. Full-time instructional faculty and staff who used e-mail to communicate with students had lower average student classroom contact hours (306 hours per week) than their colleagues who did not do so (353 hours per week). However, there were no measurable differences by use of course-specific Web sites in the average number of student contact hours per week inside the classroom. The average number of student classroom contact hours per week by part-time instructional faculty and staff in degree-granting institutions was 176 hours. Among part-time faculty and staff, no differences in average number of student contact hours per week inside the classroom were found by use of e-mail or course-specific Web sites.

The average number of office hours per week for full-time instructional faculty and staff was 6.5 hours. The average number of office hours per week by part-time instructional faculty and staff in degree-granting institutions was about one-third of full-time faculty (2 hours per week). The average number of office hours for full-time faculty who used e-mail (6.3 hours) was slightly lower than for those who did not use e-mail (7 hours).

Table 14.—Among full- and part-time postsecondary instructional faculty and staff who taught classes for credit, total number of hours per week teaching classes, and average contact with students inside and outside of the classroom, by use of e-mail and course-specific Web sites: Fall 1998

	Total number of hours per week teaching classes		Total student contact hours per week inside the classroom*		Total faculty office hours per week	
	Full-time	Part-time	Full-time	Part-time	Full-time	Part-time
Total	11.0	7.3	320.5	175.5	6.5	2.0
Used e-mail						
Yes	10.1	7.0	305.9	176.9	6.3	2.1
No	13.2	7.6	353.4	174.4	7.0	1.9
Used Web site						
Yes	10.5	7.4	322.3	181.4	6.3	2.0
No	11.4	7.3	319.3	172.5	6.6	2.0

*Total student contact hours are calculated as follows: hours per week spent teaching a given class multiplied by the number of students in the class, summed for up to five for-credit classes for which the respondent was asked to provide information.

NOTE: This table includes only instructional faculty and staff who taught one or more classes for credit.

SOURCE: U.S. Department of Education, National Center for Education Statistics, 1999 National Study of Postsecondary Faculty (NSOPF:99).

Summary and Conclusions

In fall 1998, access to the Internet was common for postsecondary instructional faculty and staff. About 69 percent of full-time faculty and 46 percent of part-time faculty used e-mail to communicate with students in their classes, and 40 percent of full-time faculty and 34 percent of part-time faculty used course-specific Web sites. Additionally, faculty and students in postsecondary institutions actively use these media to communicate and disseminate information. Instructional faculty and staff reported that an average of about 32–33 percent of their students used e-mail for course-specific communication, and that they spent an average of 2.7 hours per week responding to students' e-mail communications. In addition, of those who used course-specific Web sites, a majority used them for posting general class information and links to other information. Finally, while instructional faculty and staff who used e-mail or course-specific Web sites reported working more hours per week on average than those who did not do so, they also reported lower overall teaching and contact hours with students in the classroom.

While the overall findings in this report indicate increasing integration of telecommunications technologies in postsecondary settings, there are three key caveats. First, there were wide differences between full- and part-time faculty in access to and use of telecommunications technologies. Without exception, full-time faculty reported more access to the Internet and more use of e-mail and course-specific Web sites than part-time faculty. Second, Internet access and the quality of computing resources were important factors in the use of telecommunications technologies. Postsecondary instructional faculty and staff who had access to the Internet both at home and at work were significantly more likely to use e-mail and course-specific Web sites than those who had access only at home or only at work. Clearly, the amount of Internet access was a main indicator of use for both e-mail and course-specific Web sites, and it remained important after controlling for other variables. After controlling for other variables, the quality of computing resources also remained a significant factor in the likelihood of using course-specific Web sites: overall, instructional faculty and staff who rated their institution's computing resources as good or excellent were more likely to use course-specific Web sites than were those who rated the computing resources as poor. Finally, the type of institution was shown repeatedly to be a key factor. In particular, postsecondary instructional faculty and staff at 4-year doctoral institutions were significantly more likely to use e-mail and course-specific Web sites than those at 4-year nondoctoral or 2-year institutions.

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Appendix A—Glossary

This glossary describes the variables used in this report. The variables were taken directly from the NSOPF:99 Data Analysis System (DAS), an NCES software application that generates tables from the NSOPF:99 data. A description of the DAS software can be found in appendix B.

In the index below, the variables are organized by general topic and, within topic, listed in the order they appear in the report. The glossary is in alphabetical order by variable label (displayed in capital letters to the right of the name).

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Percent of time spent on research activities Q31A3
Percent of time spent on administration activities Q31A5
Percent of time spent on service/ other activities X03Z31

Tenure status **Q10**

Faculty response to the question "What was your tenure status at this institution during the 1998 Fall Term?"

Tenured
Tenured-track
Non–tenure-track/no tenure system

Percent of time spent on research activities **Q31A3**

Faculty response to the question "What percent of your time do you spend in research/scholarship activities (including research; reviewing or preparing articles or books; attending or preparing for professional meetings or conferences; reviewing proposals; seeking outside funding; giving performances or exhibitions in the fine or applied arts; or giving speeches)?" This analysis looks at the average percentage.

Percent of time spent on administrative activities **Q31A5**

Faculty response to the question "What percent of your time do you spend in administration (including departmental or institution-wide meetings or committee work)?" This analysis looks at the average percentage.

Total number of classes taught for credit **Q40**

Faculty response to the question "How many of the classes/sections that you taught during the 1998 Fall Term were for credit?" For this analysis, only those who reported teaching at least one class for credit were selected.

Used course-specific Web sites **Q43**

Faculty response to the question "During the 1998 Fall Term, did you have websites for any of the classes you taught?" Response options were "Yes" and "No."

Used Web sites to post general class information **Q44A**

Faculty response to the question "Did you use the websites to post general classroom information, such as the syllabus and office hours?" Response options were "Yes" and "No." This question was asked only of those respondents who said "Yes" to Q43.

Used Web sites to post assignments **Q44B**

Faculty response to the question "Did you use the websites to post information on homework assignments or readings?" Response options were "Yes" and "No." This question was asked only of those respondents who said "Yes" to Q43.

Used Web sites to post self-scoring sample tests **Q44C**

Faculty response to the question "Did you use the websites to post practice exams or exercises that provide immediate scoring?" Response options were "Yes" and "No." This question was asked only of those respondents who said "Yes" to Q43.

Used Web sites to post exams or exam results **Q44D**

Faculty response to the question "Did you use the websites to post exams or exam results?" Response options were "Yes" and "No." This question was asked only of those respondents who said "Yes" to Q43.

Used Web sites to post links to other information **Q44E**

Faculty response to the question "Did you use the websites to provide links to other information?" Response options were "Yes" and "No." This question was asked only of those respondents who said "Yes" to Q43.

Used e-mail to communicate with students **Q45**

Faculty response to the question "During the 1998 Fall Term, did you use electronic mail (e-mail) to communicate with students in your classes?" Response options were "Yes" and "No."

Percent of students with whom faculty communicated via e-mail **Q46**

Faculty response to the question "Approximately what percent of the students in your classes communicated with you via e-mail during the 1998 Fall Term?" This question was asked only of those respondents who said "Yes" to Q45. This analysis looks at the average percentage reported.

Hours per week responding to student e-mail **Q47**

Faculty response to the question "Approximately how many hours per week did you spend responding to student e-mail during the 1998 Fall Term?" This question was asked only of those respondents who said "Yes" to Q45. This analysis looks at the average number of hours per week reported.

Access to the Internet **Q48**

Faculty response to the question "During the 1998 Fall Term, did you have access to the Internet both at home and at work, at work only, at home only, or did you have no Internet access?"

Both at home and at work
At work only
At home only
Neither home nor work

Employment status **Q5**

Faculty response to the question "During the 1998 Fall Term, did this institution consider you to be employed full-time or part-time?"

Full-time
Part-time

Office hours per week **Q51**

Faculty response to the question "During the 1998 Fall Term, how many regularly scheduled office hours did you have per week?" This analysis looks at the average number of office hours per week.

Gender **Q81**

Faculty response to the question "Are you male or female?"

Male
Female

Instructional duties for credit **X01Z1**

Indicates whether respondents had any instructional duties for credit at the institution from which they were sampled during the 1998 Fall Term. Used to identify respondents included in this analysis.

Academic rank **X01Z8**

Identifies respondents' academic rank, title, or position at their sampled institution or to identify the fact that ranks are not assigned.

Full professor
Associate professor
Assistant professor
Instructor/lecturer
Other/no rank

Average number of hours worked per week **X01Z30**

Provides a calculation of the total number of hours worked per week as the sum of the hours per week spent on the following: all paid activities at this institution; all unpaid activities at this institution; any other paid activities outside this institution (e.g., consulting, working on other jobs); and unpaid (pro bono) professional activities outside this institution.

Percent of time spent on teaching activities **X01Z31**

Reports the average percentage of work time respondents spent on teaching activities during fall 1998. Teaching activities include teaching; grading papers; preparing courses; developing new curricula; advising or supervising students; supervising student teachers and interns; and working with student organizations or intramural athletics.

Hours per week teaching classes **X01Z41**

Provides a calculation of the total number of hours spent teaching per week at five or fewer classes for credit by adding together the number of hours the respondent spent teaching each class. This analysis looks at the average number of hours per week teaching classes. NOTE: This will be an underestimate of workload for those teaching more than five classes per week.

Student classroom contact hours per week **X02Z41**

Provides a calculation of the total student classroom contact hours per week: the hours per week spent teaching a given class multiplied by the number of students in the class, summed for up to five for-credit classes for which the respondent was asked to provide information. This analysis looks at the average number of student contact hours per week. NOTE: This will be an underestimate of workload for those teaching more than five classes per week.

Quality of computing resources **X02Z60**

Indicates respondents' opinions of their institution's computing resources. It is the average of respondents' ratings of their institution's personal computers and local networks, centralized (main frame) computer facilities, Internet connections, and technical support for computer-related activities.

Poor
Fair
Good
Excellent

Percent of time spent on service/other activities **X03Z31**

Reports the average percentage of work time respondents spent in activities other than teaching, research, or administration during fall 1998. This includes time spent on professional growth, service, outside consulting, freelance work, or other outside work/other nonteaching professional activities.

Race/ethnicity **X03Z84**

This derived variable was created to categorize individuals into one racial/ethnic category. Respondents were asked to pick one or more racial categories to identify themselves. The categories were American Indian or Alaska Native; Asian; Black or African American; Native Hawaiian or Other Pacific Islander; White. There was a separate item that asked about Hispanic or Latino ethnicity. For those individuals who picked more than one racial/ethnic category, a coding scheme was devised to place them into one and only one racial/ethnic category. If the respondents identified themselves as Hispanic and Black or Hispanic and White, they were coded as Hispanic. If they were Asian or Pacific Islander and any other race (except for Black), they were coded as Asian. If they were American Indian or Alaska Native and any other race (except for Black or Asian), they were coded as American Indian. If they were Black (not Hispanic) and any other race, they were coded as Black. The resulting categories are as follows.

American Indian/Alaska Native
Asian/Pacific Islander
Black, non-Hispanic
Hispanic
White, non-Hispanic

Age **X03Z82**

Indicates the respondent's age.

Under 35
35–44
45–54
55–64
65 or older

Level of students taught **X06Z41**

For up to five for-credit classes, respondents indicated whether the primary level of students in the class was undergraduate, graduate, or first-professional. Graduate and first-professional are combined, and this composite variable reports the levels indicated by the respondent for all for-credit classes.

Undergraduate only
Undergraduate and graduate
Graduate only

Institution type **X08Z0**

Indicates the level, highest degree type, and control of the respondent's institution in a modified Carnegie classification scheme. Institutions are grouped by 4-year and 2-year designations, by control (public and private), and by types of degrees offered (doctoral and nondoctoral). This variable is identical to derived variable X08_0 in 1993.

4-year doctoral
4-year nondoctoral
2-year

Principal field of teaching **Q14**

Classifies the general program area of the respondent's principal field of teaching, based on faculty response to the question "What is your principal field or discipline of teaching?" Original responses were aggregated into the following categories for this variable:

Business	Includes accounting, banking and finance, business administration and management, business administrative support, human resources development, organizational behavior, marketing and distribution, other business, and agribusiness and agricultural production.
Education	Includes general education, basic skills, bilingual and cross-cultural education, curriculum and instruction, education administration, education evaluation and research, educational psychology, higher education, special education, student counseling, other education, pre-elementary, elementary, secondary, adult and continuing, other general teacher education programs, and library and archival sciences.

Engineering and computer sciences	Includes general engineering, civil engineering, electrical and communication engineering, mechanical engineering, chemical engineering, other engineering, engineering-related technologies, computer and information sciences, computer programming, data processing, systems analysis, other computer science, architecture and environmental design, city, community, and regional planning, and other architecture and environmental design.
Fine arts	Includes art history and appreciation, crafts, dance, design, dramatic arts, film arts, fine arts, music, music history and appreciation, other visual or performing arts, and interior design.
Health sciences	Includes allied health technologies, dentistry, health services administration, medicine (including psychiatry), nursing, pharmacy, public health, veterinary medicine, and other health sciences.
Human services	Includes home economics, parks and recreation, theology, physical education, protective services, and public affairs.
Humanities	Includes general English, composition and creative writing, American literature, English literature, linguistics, speech, debate, and forensics, English as second language, other English, foreign languages-unspecified, Chinese, French, German, Italian, Latin, Japanese, other Asian, Russian or other Slavic, Spanish, other foreign languages, philosophy and religion, and history.
Life sciences	Includes agricultural, animal, food and plant sciences, renewable natural resources, other agriculture, biochemistry, biology, botany, genetics, immunology, microbiology, physiology, zoology, and other biological sciences.
Natural/physical sciences and mathematics	Includes mathematics and statistics, astronomy, chemistry, physics, earth, atmosphere, and oceanographic, other physical sciences, and science technologies.
Social sciences	Includes advertising, broadcasting and journalism, communications research, communication research, communication technologies, other communications, psychology, general social sciences, anthropology, archaeology, area and ethnic studies, demography, economics, geography, international relations, political science and government, sociology, and other social sciences.
Vocational	Includes industrial arts, carpentry, electrician, plumbing, other construction trades, personal services, other consumer services, electrical repair, heating, air conditioning, and refrigeration, vehicle mechanics and repairers, drafting, graphic and print communications, leatherworking and upholstering, precision metal work, woodworking, other prevision production work, air transportation, land vehicle and equip operation, water transportation, other transportation and moving, and other.

Appendix B—Technical Notes

The 1999 National Study of Postsecondary Faculty (NSOPF:99)

The 1999 National Study of Postsecondary Faculty (NSOPF:99) was sponsored by the U.S. Department of Education's National Center for Education Statistics (NCES). The Gallup Organization conducted the third cycle of NSOPF, which included 960 degree-granting postsecondary institutions with a final sample of 19,813 faculty and instructional staff from these institutions. NSOPF:99 was designed to provide a national profile of faculty, including their professional backgrounds, responsibilities, workloads, salaries, benefits, and attitudes. This third cycle followed the first NSOPF, conducted in 1987–88, with a sample of 480 institutions (including 2-year, 4-year, doctorate-granting, and other colleges and universities), more than 3,000 department chairpersons, and more than 11,000 faculty; and the second NSOPF, conducted in 1992–93, with a sample of 974 public and private not-for-profit degree-granting postsecondary institutions and 31,354 faculty and instructional staff. Additional information on the first two cycles of NSOPF is available at the NCES Web Site (*http://nces.ed.gov/surveys/nsopf/*).

A two-stage stratified, clustered probability design was used to select the NSOPF:99 sample. The institution universe for NSOPF:99 was defined by the following criteria: Title IV participating, degree-granting institutions;[8] public and private not-for-profit institutions;[9] institutions that conferred associate, bachelor's, or advanced degrees; and institutions that were located in the United States. This definition covered most colleges (including junior and community colleges), universities, and graduate and professional schools. It excluded institutions that either offered only less-than-2-year programs; were private for-profit; or were located outside the United States (e.g., in U.S. territories). In addition, it excluded institutions that offered instruction only to employees of the institutions, tribal colleges, and institutions that offered only correspondence courses. According to the NCES Integrated Postsecondary Education Data System, 3,396 institutions met these criteria and were eligible for the NSOPF:99 sample. The first-stage sampling frame consisted of this group of institutions, stratified based on the highest degrees offered and

[8]The U.S. Department of Education is no longer distinguishing among institutions based on accreditation level as used in previous sample definitions. As a result, NCES now subdivides the postsecondary institution universe into schools that have Title IV federal financial assistance participation agreements with the U.S. Department of Education and those that do not.

[9]Private for-profit institutions are not included even though they may be Title IV-participating, degree-granting institutions.

the amount of federal research dollars received. The strata distinguished public and private institutions, as well as institution type based on the Carnegie Foundation's classification system.[10]

Each institution was asked to complete an Institution Questionnaire and to provide a list of all faculty and instructional staff at their institution. The faculty universe for NSOPF:99 included all those who were designated as faculty, whether or not their responsibilities included instruction, and other (nonfaculty) personnel with instructional responsibilities. Under this definition, researchers, administrators, and other institutional staff who hold faculty positions, but who do not teach, were included in the sample. Instructional staff without faculty status also were included. Teaching assistants were not included in NSOPF:99.[11] Institution coordinators were asked to provide a list of all full- and part-time employees who had faculty status or instructional responsibilities during the 1998 fall term (i.e., the term that included November 1, 1998).

Of the 960 institutions in the sample, one was ineligible because it had merged with another institution. A total of 818 institutions provided lists of faculty and instructional staff, for a weighted list participation rate of 88.4 percent. A total of 865 institutions returned the institution questionnaire, for a weighted response rate of 92.8 percent. Initially, 28,576 faculty and instructional staff were selected from institutions that provided a list of their faculty and instructional staff. Subsequently, a subsample of 19,813 faculty and instructional staff was drawn for intensive followup. Approximately 18,000 faculty and instructional staff questionnaires were completed, for a weighted response rate of 83.0 percent. The overall weighted faculty response rate (institution list participation rate multiplied by the faculty questionnaire response rate) was 73.4 percent.

Faculty nonresponse bias analyses did not detect any bias. Item nonresponse occurred when a respondent did not answer one or more survey questions. The item nonresponse rates were generally low for the faculty questionnaire. For more information about NSOPF:99, including a full description of faculty and item nonresponse, see the *1999 National Study of Postsecondary Faculty: Methodology Report* (NCES 2002–154).

Accuracy of Estimates

The statistics in this report are estimates derived from a sample. Two broad categories of error occur in such estimates: sampling and nonsampling errors. Sampling errors occur because observations are made only on samples of students, not on entire populations. Surveys of popula-

[10]See The Carnegie Foundation for the Advancement of Teaching, *A Classification of Institutions of Higher Education* (Princeton, NJ: 1994).

[11]However, the institution survey of NSOPF:99 included one question pertinent to teaching assistants, which asked institution respondents to estimate the percentage of undergraduate student credit hours assigned to teaching assistants. This question allows exploration of the issue of using teaching assistants in undergraduate education.

tion universes are not subject to sampling errors. Estimates based on a sample will differ somewhat from those that would have been obtained by a complete census of the relevant population using the same survey instruments, instructions, and procedures. The standard error of a statistic is a measure of the variation due to sampling; it indicates the precision of the statistic obtained in a particular sample. In addition, the standard errors for two sample statistics can be used to estimate the precision of the difference between the two statistics and to help determine whether the difference based on the sample is large enough so that it represents the population difference.

Nonsampling errors occur not only in sample surveys but also in complete censuses of entire populations. Nonsampling errors can be attributed to a number of sources: inability to obtain complete information about all faculty and staff in all institutions in the sample (some faculty members or institutions refused to participate, or faculty participated but answered only certain items); ambiguous definitions; differences in interpreting questions; inability or unwillingness to give correct information; mistakes in recording or coding data; and other errors of collecting, processing, sampling, and imputing missing data. Although nonsampling errors due to questionnaire and item nonresponse can be reduced somewhat by the adjustment of sample weights and imputation procedures, correcting nonsampling errors or gauging the effects of these errors is usually difficult.

Data Analysis System

Most estimates presented in this report were produced using the NSOPF:99 Data Analysis Systems (DAS). The DAS software makes it possible for users to specify and generate their own tables from the NSOPF:99 data. With the DAS, users can replicate or expand upon the tables presented in this report. In addition to the table estimates, the DAS calculates proper standard errors[12] and weighted sample sizes for these estimates. For example, table B1 contains standard errors that correspond to table 2 in this report, and was generated by the DAS. If the number of valid cases is too small to produce a reliable estimate (less than 30 cases), the DAS prints the message "low-N" instead of the estimate.

[12]The NSOPF:99 samples are not simple random samples, and therefore simple random sample techniques for estimating sampling error cannot be applied to these data. The DAS takes into account the complexity of the sampling procedures and calculates standard errors appropriate for such samples. The method for computing sampling errors used by the DAS involves approximating the estimator by the linear terms of a Taylor series expansion. The procedure is typically referred to as the Taylor series method.

Table B1.—Standard errors for table 2: Percentage distribution of full- and part-time postsecondary instructional faculty and staff according to where they had access to the Internet, by selected demographic and academic characteristics: Fall 1998

	Had access to the Internet							
	Full-time				Part-time			
	Any access	Both at home and work	At work only	At home only	Any access	Both at home and work	At work only	At home only
Total	0.24	0.71	0.68	0.29	0.71	1.13	0.84	0.88
Age								
Under 35	0.35	2.28	2.22	0.58	1.92	3.22	2.57	2.90
35–44	0.47	1.38	1.31	0.49	1.21	2.06	1.42	1.77
45–54	0.36	1.11	1.02	0.47	0.98	1.81	1.26	1.41
55–64	0.42	1.27	1.21	0.50	1.56	2.39	1.96	1.92
65 or older	1.64	3.04	3.33	0.98	2.97	3.63	2.76	2.08
Gender								
Male	0.29	0.92	0.89	0.29	0.96	1.52	1.19	1.08
Female	0.41	1.03	0.96	0.51	0.95	1.57	1.15	1.36
Race/ethnicity								
American Indian/Alaska Native	1.19	6.68	6.78	1.09	5.12	11.24	8.07	5.71
Asian/Pacific Islander	0.81	2.29	2.18	0.93	3.01	6.61	4.77	3.14
Black, non-Hispanic	1.33	2.71	2.71	1.86	3.34	3.95	3.10	2.91
Hispanic	0.53	3.60	3.58	0.73	2.41	4.85	3.71	4.54
White, non-Hispanic	0.27	0.76	0.72	0.30	0.77	1.19	0.91	0.95
Academic rank								
Full professor	0.44	1.21	1.18	0.37	2.42	4.96	3.79	2.96
Associate professor	0.35	1.36	1.25	0.52	1.95	4.97	3.18	4.60
Assistant professor	0.40	1.44	1.41	0.57	2.84	3.86	2.91	3.40
Instructor/lecturer	0.74	1.78	1.63	0.73	0.94	1.43	1.05	1.13
Other ranks/not applicable	0.92	2.33	2.16	1.07	1.25	2.06	1.55	1.74
Level of students taught[1]								
Undergraduate only	0.31	0.81	0.79	0.35	0.81	1.22	0.95	0.97
Undergraduate and graduate	0.32	1.54	1.52	0.52	1.59	5.21	3.47	3.51
Graduate only	0.62	1.66	1.59	0.70	1.50	2.95	2.06	2.38

See footnotes at end of table.

Table B1.—Standard errors for table 2: Percentage distribution of full- and part-time postsecondary instructional faculty and staff according to where they had access to the Internet, by selected demographic and academic characteristics: Fall 1998—Continued

	Had access to the Internet							
	Full-time				Part-time			
	Any access	Both at home and work	At work only	At home only	Any access	Both at home and work	At work only	At home only
Principal field of teaching[2]								
Business	0.54	2.16	2.13	0.71	1.47	3.59	2.01	2.53
Education	0.41	2.36	2.18	1.45	2.30	3.35	2.84	2.85
Engineering and computer sciences	0.28	2.00	1.95	0.40	0.52	3.09	2.70	1.98
Fine arts	1.19	2.88	2.69	1.24	2.86	2.68	1.98	3.30
Health sciences	0.60	1.91	1.72	0.75	2.02	3.32	1.86	2.99
Human services	1.22	2.78	2.76	1.25	3.05	3.65	2.51	3.47
Humanities	0.64	1.68	1.65	0.71	1.69	2.15	2.03	1.89
Life sciences	0.62	2.34	2.27	0.46	4.84	5.57	4.52	5.18
Natural/physical sciences and mathematics	0.39	1.82	1.79	0.56	2.01	3.12	2.92	2.71
Social sciences	0.82	1.70	1.56	0.37	1.28	3.14	2.34	2.55
Vocational fields	1.70	3.52	3.30	2.19	3.00	6.83	5.45	3.24
Tenure status								
Tenured	0.32	0.91	0.86	0.31	2.59	5.28	3.99	3.84
On tenure track	0.43	1.43	1.43	0.62	4.36	8.11	5.11	8.07
No tenure[3]	0.51	1.33	1.22	0.61	0.74	1.16	0.86	0.91

[1]Based on reports of the primary level of students taught in up to five for-credit classes.

[2]Included in the total but not shown separately are those who did not specify a principal field of teaching.

[3]This group includes those not on tenure track or those at institutions with no tenure system.

NOTE: This table includes only instructional faculty and staff who taught one or more classes for credit.

SOURCE: U.S. Department of Education, National Center for Education Statistics, 1999 National Study of Postsecondary Faculty (NSOPF:99).

The DAS can be accessed electronically at http://nces.ed.gov/DAS. For more information about the NSOPF:99 Data Analysis System, contact:

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Statistical Procedures

Two types of statistical procedures were employed in this report: testing differences between means (or proportions) and testing for linear trends. Each procedure is described below.

Differences Between Means or Proportions

Since the estimates in this report are based on a sample, observed differences between two estimates can reflect either of two possibilities: differences that exist in the population at large and are reflected in the sample, or differences due solely to the composition of the sample that do not reflect underlying population differences. To minimize the risk of erroneously interpreting differences due to sampling alone as signifying population differences (a Type I error), the statistical significance of differences between estimates was tested using a *t*-test. Statistical significance was determined by calculating *t* values for differences between pairs of means or proportions and comparing these with published values of *t* for two-tailed hypothesis testing, using a 5 percent probability of a Type I error (a significance level of .05).[13]

The *t* values may be computed to test the difference between estimates with the following formula:

$$t = \frac{E_1 - E_2}{\sqrt{se_1^2 + se_2^2}} \qquad (1)$$

where E_1 and E_2 are the estimates to be compared and se_1 and se_2 are their corresponding standard errors. Note that this formula is valid only for independent estimates. When estimates are not independent, a covariance term must be added to the formula:

$$\frac{E_1 - E_2}{\sqrt{se_1^2 + se_2^2 - 2(r)se_1\ se_2}} \qquad (2)$$

where *r* is the correlation between the two variables.[14] The denominator in this formula will be at its maximum when the two estimates are perfectly negatively correlated, that is, when $r = -1$. This means that a conservative dependent test may be conducted by using –1 for the correlation in this formula, or

[13] A Type I error occurs when one erroneously concludes that a difference observed in a sample reflects a true difference in the population from which the sample was drawn.

[14] U.S. Department of Education, National Center for Education Statistics, *A Note from the Chief Statistician*, no. 2, 1993.

$$t = \frac{E_1 - E_2}{\sqrt{(se_1)^2 + (se_2)^2 + 2se_1se_2}}. \quad (3)$$

The estimates and standard errors are obtained from the DAS.

There are hazards in reporting statistical tests for each comparison. First, comparisons based on large *t* statistics may appear to merit special attention. This can be misleading since the magnitude of the *t* statistic is related not only to the observed differences in means or percentages but also to the number of sample members in the specific categories used for comparison. Hence, a small difference compared across a large number of sample members would produce a large *t* statistic.

A second hazard in reporting statistical tests for each comparison occurs when making multiple comparisons between categories of an independent variable. For example, when making paired comparisons between different levels of income, the probability of a Type I error for these comparisons taken as a group is larger than the probability for a single comparison. When more than one difference between groups of related characteristics or "families" are tested for statistical significance, one must apply a standard that assures a level of significance for all of those comparisons taken together. One such procedure is known as the Bonferroni adjustment.

Comparisons were made in this report only when $p \leq .05/k$ for a particular pairwise comparison, where that comparison was one of k tests within a family. This helps to assure both that the individual comparison would have $p \leq .05$ and that for k comparisons within a family of possible comparisons, the significance level for all the comparisons would sum to $p \leq .05$.[15]

For example, when comparing males and females, only one comparison is possible. In this family, k=1, and there is no need to adjust the significance level. When faculty members are divided into five racial/ethnic groups and all possible comparisons are made, then k=10 and the significance level for each test within this family of comparisons must be $p \leq .05/10$, or $p \leq .005$. The formula for calculating family size (k) is as follows:

$$k = \frac{j(j-1)}{2} \quad (4)$$

[15]The standard that $p \leq .05/k$ for each comparison is more stringent than the criterion that the significance level of the comparisons should sum to $p \leq .05$. For tables showing the *t* statistic required to ensure that $p \leq .05/k$ for a particular family size and degrees of freedom, see Olive Jean Dunn, "Multiple Comparisons Among Means," *Journal of the American Statistical Association* 56 (1961): 52–64.

where j is the number of categories for the variable being tested. For example, in the case of a variable with five categories such as race/ethnicity, one substitutes 5 for j in equation 4:

$$k = \frac{5(5-1)}{2} = 10$$

Different schools of thought exist on the application of the Bonferroni adjustment: while some would use an experiment-wise calculation of k, where all the dependent variables were considered simultaneously in selecting a critical value, here the calculation of k and the accompanying critical value were restricted to a single dependent variable at a time, since the Bonferroni adjustment is already a conservative strategy.

Linear Trends

While most descriptive comparisons in this report were tested using Student's t statistic, some comparisons across categories of an ordered variable with three or more levels (e.g., faculty's age) involved a test for a linear trend across all categories, rather than a series of tests between pairs of categories. In this report, when averages of a continuous variable were examined relative to a variable with ordered categories, Analysis of Variance (ANOVA) was used to test for a linear relationship between the two variables. To do this, ANOVA models included orthogonal linear contrasts corresponding to successive levels of the independent variable. The squares of the Taylorized standard errors (that is, standard errors that were calculated by the Taylor series method), the variance between the means, and the unweighted sample sizes were used to partition total sum of squares into within- and between-group sums of squares. These were used to create mean squares for the within- and between-group variance components and their corresponding F statistics, which were then compared with published values of F for a significance level of .05.[16] Significant values of both the overall F and the F associated with the linear contrast term were required as evidence of a linear relationship between the two variables. Means and Taylorized standard errors were calculated by the DAS. Unweighted sample sizes are not available from the DAS and were provided by NCES.

Bivariate Correlations

For the bivariate correlations reported in the report, the strength of the relationships between pairs of variables was provided using a scale of magnitudes. Following Cohen,[17] reported

[16]More information about ANOVA and significance testing using the F statistic can be found in any standard textbook on statistical methods in the social and behavioral sciences.

[17]Cohen, J., *Statistical Power Analysis for the Behavioral Sciences* (2nd Ed., Hillsdale, NJ: Lawrence Erlbaum Associates, 1998).

magnitudes adopted the notion of a scale of small-, moderate-, and large-sized relationships, qualitative terms that allow interpretation of the strength of a relationship through the concept of effect size. Cohen suggested that for a scale of the proportion of variance accounted for (the square of the correlation coefficient, R^2), one might use a value of 0.01 to signify a small effect size, 0.09 for moderate, and 0.25 for large. Some latitude is appropriate in determining the scale of effect sizes within the context of the analysis. The magnitudes reported in this report were based on a scale in which the effect is small if R^2 is less than 0.05, moderate if R^2 is at least 0.05 but less than 0.25, and large if R^2 is 0.25 or greater.

Adjustment of Means to Control for Background Variation

Many of the independent variables included in the analyses in this report are related, and to some extent the pattern of differences found in the descriptive analyses reflect this covariation. For example, when examining the percentage of instructional faculty and staff who used telecommunications technologies, it is possible that some of the observed relationship is due to differences in other factors, such as institution type, access to the Internet, the level of students taught, and so on. However, if nested tables were used to isolate the influence of these other factors, cell sizes would become too small to identify the significant differences in patterns. When the sample size becomes too small to support controls for another level of variation, one must use other methods to take such variation into account. The method used in this report estimates adjusted means with regression models, an approach sometimes referred to as communality analysis.

To overcome this difficulty, multiple linear regression was used to obtain means that were adjusted for covariation among a list of control variables.[18] Each independent variable is divided into several discrete categories. To find an estimated mean value on the dependent variable for each category of an independent variable, while adjusting for its covariation with other independent variables in the equation, substitute the following in the equation: (1) a one in the category's term in the equation, (2) zeroes for the other categories of this variable, and (3) the mean proportions for all other independent variables. This procedure holds the impact of all remaining independent variables constant, and differences between adjusted means of categories of an independent variable represent hypothetical groups that are balanced or proportionately equal on all other characteristics included in the model as independent variables.

[18]For more information about least squares regression, see Michael S. Lewis-Beck, *Applied Regression: An Introduction*, Vol. 22 (Beverly Hills, CA: Sage Publications, Inc., 1980); William D. Berry and Stanley Feldman, *Multiple Regression in Practice*, Vol. 50 (Beverly Hills, CA: Sage Publications, Inc., 1987).

For example, consider a hypothetical case in which two variables, employment status and gender, are used to describe an outcome, *Y* (such as percentage of respondents using e-mail). The variables employment status and gender are recoded into a dummy variable representing employment status, *E*, and a dummy variable representing gender, *G*:

Employment status	E
Part-time	1
Full-time	0

and

Gender	G
Female	1
Male	0

The following regression equation is then estimated from the correlation matrix output from the DAS as input data for standard regression procedures:

$$Y = a + b_1E + b_2G \tag{5}$$

To estimate the adjusted mean for any subgroup evaluated at the mean of all other variables, one substitutes the appropriate values for that subgroup's dummy variables (1 or 0) and the mean for the dummy variable(s) representing all other subgroups. For example, suppose *Y* represents the proportion of instructional faculty and staff using e-mail, which is being described by employment status (*E*) and gender (*G*), coded as shown above. Suppose the unadjusted mean values of these two variables are as follows:

Variable	Mean
E	0.426
G	0.414

Next, suppose the regression equation results are as follows:

$$Y = 0.60 - 0.08E - 0.02G \tag{6}$$

To estimate the adjusted value for part-time faculty, one substitutes the appropriate parameter estimates and variable values into equation 6.

Variable	Parameter	Value
a	0.60	—
E	-0.08	1.000
G	-0.02	0.414

This results in the following equation:

$$Y = 0.60 - (0.08)(1) - (0.02)(0.414) = 0.512$$

In this case, the adjusted mean for part-time faculty is 0.512 and represents the expected outcome for part-time faculty who resemble the average faculty member across the other variables (in this example, gender). In other words, the adjusted percentage of part-time faculty using e-mail, controlling for gender, is 51.2 percent (0.512 x 100 for conversion to a percentage). In addition to presenting the regression coefficients, their standard errors, and the unadjusted and adjusted percentages for each subgroup, the tables of regression results also indicate the multiple R^2, the proportion of the variance in the outcome variable accounted for by all of the other variables included in the multivariate model.

It is relatively straightforward to produce a multivariate model using the DAS, since one of the DAS output options is a correlation matrix, computed using pairwise missing values. In regression analysis, there are several common approaches to the problem of missing data. The two simplest are pairwise deletion of missing data and listwise deletion of missing data. In pairwise deletion, each correlation is calculated using all of the cases for the two relevant variables. For example, suppose you have a regression analysis that uses variables X1, X2, and X3. The regression is based on the correlation matrix between X1, X2, and X3. In pairwise deletion the correlation between X1 and X2 is based on the nonmissing cases for X1 and X2. Cases missing on either X1 or X2 would be excluded from the calculation of the correlation. In listwise deletion the correlation between X1 and X2 would be based on the nonmissing values for X1, X2, and X3. That is, all of the cases with missing data on any of the three variables would be excluded from the analysis.

The correlation matrix can be used by most statistical software packages as the input data for least squares regression. That is the approach used for this report, with an additional adjustment to incorporate the complex sample design into the statistical significance tests of the parameter estimates (described below). For tabular presentation, parameter estimates and standard errors were multiplied by 100 to match the scale used for reporting unadjusted and adjusted percentages.

Most statistical software packages assume simple random sampling when computing standard errors of parameter estimates. Because of the complex sampling design used for the NSOPF survey, this assumption is incorrect. A better approximation of their standard errors is to multiply

each standard error by the design effect associated with the dependent variable (DEFT),[19] where the DEFT is the ratio of the true standard error to the standard error computed under the assumption of simple random sampling. It is calculated by the DAS and produced with the correlation matrix output.

[19]The adjustment procedure and its limitations are described in C.J. Skinner, D. Holt, and T.M.F. Smith, eds., *Analysis of Complex Surveys* (New York: John Wiley & Sons, 1989).

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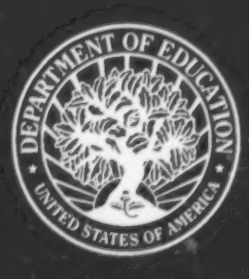

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